* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
1. A substrate with the 1st flat two-dimensional field and the 2nd flat two-dimensional field that faces it is included, The 1st page includes two or more micro channels and sample input means which are embedded into it, The 2nd flat two-dimensional field it is connected, and a sample input means and a micro channel carry out fluid contact, and faces the 1st flat two-dimensional field of a platform, A microsystem platform coded electromagnetically for controlling speed of rotation of a platform, a period, or a direction with an instruction set which can be read, A minute manual operating device and an operation control means including a base, a pivot means, a power supply, and a user interface which it is connected so that a pivot means may act on a microsystem platform functionally, and carry out rotary contact to it, It is fluid minute operation equipment moved to a centripetal target which is **********, During time when a lot of fluids in a micro channel of a platform are sufficient to move a fluid through a micro channel, And fluid minute operation equipment which is moved through said micro channel by central force produced from rotational movement of a platform with revolving speed and which is moved to a centripetal target.
2. A substrate with the 1st flat two-dimensional field and the 2nd flat two-dimensional field that faces it is included, A micro channel of plurality [page / 1st], a reaction chamber, and a reagent reservoir embedded into it, Including a sample input means, and a sample input means, a micro channel, a reaction chamber, And the 2nd flat two-dimensional field it is connected, and a reagent reservoir carries out fluid contact, and faces the 1st flat two-dimensional field of a platform, A microsystem platform electromagnetically coded with an instruction set which can be read in order to control speed, a period, or a direction of rotation of a platform, A pivot means acts on a microsystem platform functionally, A minute manual operating device including a base, a pivot means, a power supply, and a user interface which are connected by carrying out rotary contact to it, and an operation control means, It is fluid

minute operation equipment which is ********** and which is moved to a centripetal target, . A lot of fluids in a micro channel of a platform are moved through said micro channel by central force produced from rotational movement of a platform during sufficient time to move a fluid through a micro channel, and with revolving speed. Fluid minute operation equipment moved to centripetal target.

3. A substrate with the 1st flat two-dimensional field and the 2nd flat two-dimensional field that faces it is included, A reagent reservoir by which the 1st page is embedded two or more micro channels, a reaction chamber, and into it, Including a sample input means, and a sample input means, a micro channel, a reaction chamber, Are connected, and a reagent reservoir carries out fluid contact and And a micro channel, a reaction chamber, And fluid motion from a reagent reservoir is controlled by a micro valve connected to it, The 2nd flat two-dimensional field that faces the 1st flat two-dimensional field of a platform, A microsystem platform coded electromagnetically for controlling speed, a period, or a direction of rotation of a platform with an instruction set which can be read, A pivot means acts on a microsystem platform functionally, A minute manual operating device including a base, a pivot means, a power supply, and a user interface which are connected by carrying out rotary contact to it, and an operation control means, it is fluid minute operation equipment moved to a centripetal target which is ********** -- a lot of fluids in a micro channel of a platform during sufficient time to move a fluid through a micro channel, and it is moved through said micro channel by central force produced from rotational movement of a platform with revolving speed -- fluid minute operation equipment moved to a centripetal target.

4. Apparatus according to claim 1 by which the 1st flat two-dimensional field of microsystem platform and the 2nd flat two-dimensional field form disk.

5. The 1st of a microsystem platform and the 2nd flat two-dimensional field, The apparatus according to claim 1 which limits aperture arranged at a centripetal target attached to a spindle on a minute manual operating device and from which rotational movement of a spindle is changed into rotational movement of a microsystem platform by that cause.

6. Apparatus according to claim 1 by which microsystem platform comprises material chosen from group who consists of organic substance, mineral matter, crystalline substance substance, and amorphous materials.

7. Apparatus according to claim 6 by which microsystem platform includes material further chosen from group who consists of silicon, silica, quartz, ceramics, metal, or plastic.

8. Apparatus according to claim 4 whose microsystem platform is disk about 1 to 25 cm in radius.

9. Apparatus according to claim 1 microsystem platform is about 0.1 to 100 mm in thickness, and cross section size of micro channel between the 1st and 2nd flat two-dimensional side is less than 500 micrometers, and is [apparatus] 90% from said 1% of cross section sizes of

platform.
10. The apparatus according to claim 10 whose microsystem platform is about 0.1 to 100 mm in thickness and a reaction chamber between the 1st and 2nd flat two-dimensional side or whose cross section size of a reagent reservoir is 75% from said 1% of thickness of a platform.

11. The apparatus according to claim 1 which a microsystem platform rotates with revolving speed of about 1 to about 30,000 rpm.
A microsystem platform 12. Two or more sample input means, A lot of fluids which are connected to a reagent reservoir, a reaction chamber, and it, contain a micro channel embedded into it, and contain a sample according to central force produced from rotation of a microsystem platform. The apparatus according to claim 1 to which it is moved from inside of a reaction chamber, and a reaction chamber from a sample input means on a disk, and a lot of reagents are moved from inside of a reaction chamber, and a reaction chamber from a reagent reservoir.
13. In order that a detection chamber may take out an assay output including a detection chamber which a microsystem platform is embedded in the 1st [of a platform] flat two-dimensional side, and is connected to a micro channel in a minute manual operating device, The apparatus according to claim 1 containing a detection means authorized by a detection means.
14. The apparatus according to claim 13 by which alignment of the detection means on a device is carried out to a detection chamber on a platform by rotational movement of a microsystem platform.
15. The apparatus according to claim 13 by which a detection means contains a light source and a photodetector.
16. The apparatus according to claim 15 which a light source illuminates a detection chamber, and light is horizontally reflected through a detection chamber, and is detected by a photodetector.
17. A detection chamber on a microsystem platform is the transparent apparatus according to claim 16 optically.
18. The apparatus according to claim 14 which a detection means is standing it still and samples a detection chamber by frequency of rotation of a platform, or frequency equal to the multiple.
19. The apparatus according to claim 18 by which a detection means contains a stroboscope light source.
20. The apparatus according to claim 19 whose detection means is a monochromatic light source.
21. The apparatus according to claim 13 by which a detection means detects an absorbance,

fluorescence, chemical luminescence, optical dispersion, or radioactivity.
22. The apparatus according to claim 1 which includes further a temperature control element which carries out heat contact with a micro platform.
23. The apparatus according to claim 1 which includes further a heat detecting means which carries out heat contact with a micro platform.
24. The apparatus according to claim 1 by which a microsystem platform includes a filter means connected with a micro channel.
25. The apparatus according to claim 1 by which a microsystem platform contains a mixing element connected to a reaction reservoir or a micro channel.
26. The apparatus according to claim 25 containing a static mixer in which a microsystem platform includes a field from which texture of a reaction reservoir or a micro channel was taken out.
A microsystem platform 27. A micro channel, a reaction reservoir, The apparatus according to claim 3 by which a fluid flow on a microsystem platform is controlled by opening and closing of a micro valve including a reagent chamber, a sample input means, and two or more micro valves connected so that it may act on a sample outflow port functionally.
28. The apparatus according to claim 27 by which a microsystem platform contains a capillary tube micro valve connected to a reaction chamber or a micro channel.
29. The apparatus according to claim 1 by which a microsystem platform includes two or more air channels, exhaust ports, and air displacement channels.
30. The apparatus according to claim 1 whose pivot means of a device is an electric motor.
31. The apparatus according to claim 1 including a rotational movement control means for a device to control acceleration and speed of rotation of a microsystem platform.
32. The apparatus according to claim 1 by which a device possesses a user interface containing a monitor and an alphanumeric character keypad.
33. The apparatus according to claim 1 by which a device contains AC power supply or DC power supply.
34. The apparatus according to claim 1 by which a microsystem platform possesses an electrical connector connected to a minute manual operating device, and an electrical connector which contacts.
35. The apparatus according to claim 1 by which a device contains a microprocessor and a memory connected to it.
36. The apparatus according to claim 1 by which a device includes a reading means and a writing means.
37. The apparatus according to claim 36 whose reading means is a compact disc laser reading means.
38. The apparatus according to claim 36 whose writing means is a compact disc writing

means.
39. The apparatus according to claim 1 by which the 2nd flat two-dimensional side of a microsystem platform is coded by machine language command.
40. The apparatus according to claim 39 by which a machine language command controls operation of a platform, acquisition of data from a platform or analysis, a data storage and search, communication to other devices, or equipment performance diagnosis directly.
41. The apparatus according to claim 1 by which a minute manual operating device possesses a read only memory coded with a machine language command, or a lasting storage memory.
42. Machine language commands are control ****** and the apparatus according to claim 41 about operation of a platform, acquisition of data from a platform or analysis, a data storage and search, communication to other devices, or direct equipment performance diagnosis.
43. The apparatus according to claim 1 containing the 1st microsystem platform which contacts mutually in respect of [whole] one two dimensions of each microsystem platform further, and the 2nd microsystem platform.
44. The apparatus according to claim 1 which a microsystem platform rotates at speed of about 1 to about 30,000 rpm.
45. The apparatus according to claim 1 to which a fluid on a microsystem platform is moved within a micro channel of a platform at the fluid speed of per second about 0.1 to about 1000 cm/s.
46. Two or more sample inlet ports where a microsystem platform is arranged in concentric circle around the center of a platform connected with below so that each of a sample inlet port may act functionally, Two or more micro channels connected so that it may separate from the center of a platform, and may be arranged radiately and it may act on below functionally, Two or more reagent reservoirs which a special reagent goes into analyte of a measuring object, and release of a reagent from each of a reservoir is controlled by a micro valve, and are connected so that two or more micro channels may also act on below functionally, Two or more analyte detection chambers arranged in periphery around a rim of a micro platform, Movement of a biological sample which passes along a micro channel from an implication and a sample inlet port, And the apparatus according to claim 1 for movement of a reagent which passes along a micro channel from a reagent reservoir to measure quantity of analyte in a biological sample moved by central force produced in rotational movement of a microsystem platform.
47. The apparatus according to claim 46 whose biological sample is blood, urine, cerebrospinal fluid, plasma, saliva, sperm, or amniotic liquid.
48. An analyte detection chamber is the transparent apparatus according to claim 46 optically.
49. The apparatus according to claim 46 by which each of a micro valve and opening and closing of a valve including electric wiring between electric controller devices are further

controlled by an electrical signal from a controller device.
50. The apparatus according to claim 46 by which a micro channel is arranged by periphery from the center of a platform at linear shape.
51. The apparatus according to claim 46 by which a micro channel is arranged by periphery in concentric circle from the center of a platform.
52. The apparatus according to claim 46 by which a minute manual operating device contains a detection means.
53. The apparatus according to claim 46 which a detection means is standing it still and samples an analyte detection chamber output by frequency of rotation of a platform, or frequency equal to the multiple.
54. The apparatus according to claim 46 by which a detection means contains a stroboscope light source.
55. The apparatus according to claim 46 whose detection means is a monochromatic light source.
56. The apparatus according to claim 46 by which a detection means detects fluorescence, chemical luminescence, optical dispersion, or radioactivity.
57. characterized by comprising the following -- a method for measuring quantity of analyte in a biological sample.
A step which applies a biological sample to a sample inlet port of the microsystem platform according to claim 46.
A step which arranges a microsystem platform in a minute manual operating device.
Sufficient time to move a biological sample which contains analyte from sample entrance auto through a micro channel, and a step which provides a microsystem platform with rotational movement at a speed.
By a reagent's moving into a micro channel and generating a signal from a control device during time and a period which are mixed with a biological sample, A step which opens each of a micro valve which controls release of a reagent from a reagent reservoir, A step which observes mixing of a reagent in an analyte detection chamber which detects a signal proportional to quantity of analyte which exists in a biological sample and a sample with a biological detector containing a device, A step which records measured value of quantity of analyte in a biological sample

58. A way according to claim 57 a biological sample is blood, urine, cerebrospinal fluid, plasma, saliva, sperm, or amniotic liquid.
59. A method according to claim 57 by which measured value of quantity of analyte in a sample is recorded by a micro platform top or its both within a device.
60. An analyte detection chamber on a microsystem platform is the transparent method

according to claim 57 optically.
61. A method according to claim 57 by which a detected signal is the analyte and a detection chamber is detected by platform or frequency equal to frequency of rotation of the multiplesd.
62. A way according to claim 57 a detected signal is a monochromatic light source.
63. A way according to claim 62 a detected signal is a fluorescence signal, a chemical luminescence signal, or a colorimetry signal.
The apparatus according to claim 1 for detecting a gas or particles characterized by comprising the following.
64. A microsystem platform, Two or more sample inlet ports where it is arranged in concentric circle around the center of a platform in, and a sample port is connected with below including a suction hole and a connection funnel channel so that each of a sample inlet port may act functionally
Two or more micro channels connected with below so that it may separate from the center of a platform, and may be arranged radiately and it may act functionally.
Two or more reagent reservoirs which opening of a reagent from each of a reservoir with which a special reagent went into a gas or particles for detection is controlled by a micro valve, a micro valve contacts a controller device electrically, and are connected with below so that two or more micro channels may also be operated functionally.
Two or more gases or a detector of particles arranged in periphery around a rim of a micro platform, An environmental sample moved by central force which movement of a reagent which passes along a micro channel from an implication, a sample inlet port, and movement of an environmental sample which passes along a micro channel and a reagent reservoir produces in rotational movement of a microsystem platform.

65. The apparatus according to claim 64 by which an environmental sample contains air, water, soil, or a ground biological substance.
66. The apparatus according to claim 64 by which a detector contains a gas sensor chip.
67. The apparatus according to claim 64 by which a detector contains a transparent particle recovery chamber optically.
68. The apparatus according to claim 67 by which a detector also includes a coherent light source.
69. The apparatus according to claim 68 from which particles are detected by optical dispersion.
70. The apparatus according to claim 64 containing a particle recovery chamber connected so that a detector may act on a reagent reservoir which contains a reagent for examining particles chemically by a micro channel functionally.
A method characterized by comprising the following for detecting a gas or particles containing

71. environmental sample.
A step which contacts an environmental sample to a sample inlet port of the microsystem platform according to claim 64.
A step which arranges a microsystem platform in a minute manual operating device.
A step which provides a microsystem platform with rotational movement during sufficient time to move an environmental sample of a gas or the shape of a grain from a sample inlet port through a micro channel, and at speed.
In time which a reagent moves into a micro channel and is mixed with an environmental sample. And a step which opens each of a micro valve which controls opening of a reagent from a reagent reservoir by generating a signal from a control device during a period, A detector within a detection chamber of a gas or particles which detect a signal proportional to quantity of a gas which exists in an environmental sample, or particles, A step which detects a gas component or a granular component of a mixture of an environmental sample and a reagent, or an environmental sample directly, A step which measures a gaseous quantity or quantity of particles in an environmental sample

72. A method of claim 71 that an environmental sample contains air, water, soil, or a ground biological substance.
73. A method according to claim 71 by which a gas is detected by gas sensor chip.
74. particles -- optical -- TO -- a method according to claim 71 detected by a transparent particle recovery chamber.
75. A method according to claim 71 from which particles are detected by coherent optical dispersion.
76. It is detected by a particle recovery chamber connected so that particles may act on a reagent reservoir containing a reagent for examining particles chemically functionally by a micro channel, A method according to claim 71 by which it mixes and particles react to a reagent in a micro channel after starting of a micro valve and release of a reagent by rotation of a platform.
A microsystem platform 77. A micro channel, a sample inlet port, The apparatus according to claim 1 by which it comprises a layer on which a thin film disk including a reactant reservoir, a reaction chamber, and a sample exit port was accumulated, and each of an accumulated film disk provides a platform of this invention by an independence formula.
78. microsystem platform characterized by comprising the following, The apparatus according to claim 1 for calculating a hematocrit value from a blood sample from which it comprises a radiate array of about 100 micrometers in diameter a micro channel, it is processed by heparin in order that a micro channel may prevent coagulation, and a micro channel is wide opened by an end of contiguity at the center of a disk.

A coherent light source.
A minute manual operating device.

79. The apparatus according to claim 78 attached on a movable track with which a coherent light source is radiately arranged from the center of rotation of a platform.
80. The apparatus according to claim 78 by which an electrode contacts a blood sample in a micro channel including Clark electrode connected so that it may act on each of a micro channel of a microsystem platform functionally further.
81. The apparatus according to claim 78 by which an electrode contacts a blood sample in a micro channel including cutting electrodes connected so that it may act on each of a micro channel of a microsystem platform functionally further.
A method characterized by comprising the following for calculating a hematocrit value from 82. blood sample.
A step which applies a blood sample to a near end of a micro channel of the microsystem platform according to claim 78.
A step which arranges a microsystem platform in a minute manual operating device.
A step which provides a microsystem platform with rotational movement at sufficient time and speed to move red corpuscles containing a blood sample for moving in accordance with a grade of a micro channel.
A step which scans a micro channel along with the length by a coherent light source, A step which detects change by optical dispersion in arbitrary positions in alignment with a micro channel which limits a boundary between red corpuscles and plasma, A step which records a position of a boundary of each micro channel, A step which records a standard curve which connects a hematocrit value with a bordering position, and a hematocrit which compared a position of this boundary of each micro channel, and was called for by it

A method characterized by comprising the following for calculating a blood oxygenation value from 83. blood sample.
A step which applies a blood sample to a near end of a micro channel of the microsystem platform according to claim 80.
A step which arranges a microsystem platform in a minute manual operating device.
A step which provides a microsystem platform with rotational movement at sufficient time and speed to move a blood sample in order to contact Clark electrode connected to a micro channel.
A step which detects a blood oxygenation value of he blood sample, and a step which records a blood oxygenation value calculated by it.

A microsystem platform 84. Two or more sample input means, It is connected so that it may act on a reactant reservoir, a reaction chamber, a micro valve, and it functionally, A microsystem platform comprises an array on which a layer was accumulated including a micro channel embedded into it, The 1st layer contains a sample input means, a reactant reservoir, a reaction chamber, and a micro channel, The apparatus according to claim 1 by which the 4th layer is accumulated [the 3rd layer] for a layer on the upper part of a uniform substrate of a microsystem platform including a sealed layer including an electric connection from a micro valve to an electric controller device, and melting of the 2nd layer is carried out to it including m micro valve.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
A device and a method for using centrality acceleration, in order to promote fluid movement in the super-minute amount fluid element engineering system provided with the information science carried in the inside of a plane This application, The application number 60th / No. 008 or 215 for which it applied on December 5, 1995 which is the United States patent provisional specification in which each indication is clearly included in this book as a cited reference, The right of priority over the 60th for which it applied on the 60th for which it applied on December 6, 1995 / No. 008 or 267, the 60th for which it applied on December 8, 1995 / No. 008 or 819, and August 12, 1996 / No. 023 or 756 is claimed.
Field of a background 1. invention of an invention This invention relates to the method and device for ultramicroanalysis performing super-minute amount resultant analysis and a method and. Especially this invention relates to microminiaturization of the genetic, biochemical, and chemical process relevant to analysis, composition, and refining. More, by this invention, in order to promote fluid movement which passes along the micro channel embedded on the micro platform, the centripetal force generated as a result of rotation of a platform is used for details.
Therefore, the microsystem platform and micro manual operating device for operating a platform by rotation are provided.
The microsystem platform of this invention equips with search informatics the system-information study and the data capture, the analysis, and the memory pan which were coded further again on the surface of the disk of the opposite hand of the field containing the fluid element engineering ingredient, and is provided. A method with being extensive for ultramicroanalysis performing a super-minute amount resultant process or is also provided further again using the microsystem device of this invention.
2. Background of pertinent art The mechanical and automatic liquid treatment system and

device which were medical and biological, and were manufactured in the field of chemical assay in order to operate a macroscopic level (an example, a milliliter, and a milligram) are common knowledge in the advanced technology.

U.S. Pat. No. 4,279,862 published to Bertaudiere. on July 21, 1981 is indicating the centrifugal light measurement analysis apparatus.

U.S. Pat. No. 4,381,291 published to Ekins on April 26, 1983 is teaching the analytical measurement of an isolation ligand.

U.S. Pat. No. 4,515,889 published to Klose. on May 7, 1985 is teaching the object for automatic mixing and the reagent for culture for performing analytical measurement.

U.S. Pat. No. 4,676,952 published to Edelmann. on June 30, 1987 is teaching the light measurement analysis apparatus.

U.S. Pat. No. 4,745,072 published to Ekins on May 17, 1988 is indicating the immunoassay (immunoassay) in a biological liquid.

U.S. Pat. No. 5,160,702 published to Kopf-Sill. on November 3, 1992 is indicating the centrifugal rotor (stirrer) for analyzing the solid in a fluid.

U.S. Pat. No. 5,171,695 published to Ekins on December 15, 1992 is indicating the measuring method of the analyte concentration which uses two sign markers.

U.S. Pat. No. 5,173,262 published to Burtis. on December 22, 1996 is indicating the centrifugal rotor (stirrer) for processing a fluid.

U.S. Pat. No. 5,242,803 published to Burtis. on September 7, 1993 is indicating the rotor assembly (stirrer assembly) for performing assay.

U.S. Pat. No. 5,409,665 published to Burd on April 25, 1995 is indicating the cuvette restoration in a centrifugal rotor (stirrer).

U.S. Pat. No. 5,413,732 published to Buhl. on May 9, 1995 is teaching preparation of the freeze-drying reagent ball for using it in an automatic centrifugal hemanalysis device.

U.S. Pat. No. 5,432,009 published to Ekins on July 11, 1995 is indicating the method for analyzing the analyte in a fluid.

U.S. Pat. No. 5,472,603 published to Schembri on December 5, 1995 is indicating the rotor for analysis for performing liquid separation (stirrer).

Andcrson, 1968, and Anal.Biochem. -- volume [28th] : 545 - 562 pages of multiple cuvette rotors (stirrer) for cell separation are taught.

., Renoe et al., and Clin.Chem. -- volume [20th] : 955 - 960 pages of "mini disc" modules for a centrifugal analysis device are taught.

., Burtis et al., and Clin.Chem. -- volume [20th] : 932 - 941 pages of methods for dynamic introduction of the fluid into a centrifugal analysis device are taught.

.1975, Fritsche et al., and Clin.Biochem. -- volume [8th] : 240 - 246 pages of enzyme analysis of the blood sugar level which uses a centrifugal analysis device are taught.

., Burtis et al., and Clin.Chem. -- volume [21st] : 1225 - 1233 pages of multiple-purpose optical systems for using it together with a centrifugal analysis device are taught.
.1976, Hadjiioannou et al., and Clin.Chem. -- the biological liquid which used volume [22nd] : 802 - 805 pages of small centrifugal analysis devices -- the automatic enzyme ethanol measurement method in the living body is taught.
., Lee et al., 1978, and Clin.Chem. -- volume [24th] : 1361 - 1365 pages of automatic blood judgment systems are taught.
., Cho et al., 1982, and Clin.Chem. -- volume [28th] : 1965 - 1961 pages of multi-channel electrochemical centrifugal analysis devices are taught.
: with . [Bertrand et al.], 1982, and a Clinica Chimica Acta of volume [119th] 275 - 284 pages of the methods of measuring a 5in blood serum'-nucleotidase value automatically for having used the centrifugal analysis device are taught.
., Schembri et al., 1992, and Clin.Chem. -- volume [38th] : 1665 - 1670 pages of portable type whole blood analysis apparatus are taught.
., Waltcrs et al., 1995, Basic Medical Laboratory Technologies, the 3rd edition (the 3rd edition of fundamental clinical laboratory test technology), and Delmar Publishers:Boston are teaching various automatic clinical laboratory test analytical skills.
The ultramicroanalysis device for performing a selective reaction course in recent years has been developed.
U.S. Pat. No. 5,006,749 published to White on April 9, 1991 is indicating the method and device for using ultrasonic energy for moving a microelement.
U.S. Pat. No. 5,252,294 published to Kroy. on October 12, 1993 is teaching the micro mechanical structure for performing a fixed chemical ultramicroanalysis.
U.S. Pat. No. 5,304,487 published to Wilding. on April 19, 1994 is teaching the liquid treatment method in the device for super-minute amount scale analysis.
U.S. Pat. No. 5,368,704 published to Madou. on November 29, 1994 is teaching the micro electrochemical valve.
International application the WO93 published to University of Pennsylvania on November 11, 1993 / No. 22053 are indicating micro assembly detection structure.
International application the WO93 published to University of Pennsylvania on November 11, 1993 / No. 22058 are indicating the micro prefabricated frame structure for performing polynucleotide amplification.
., Columbus et al., 1987, and Clin.Chem. -- volume [33rd] : 1531 - 1537 pages of liquid pipe laws of a biological liquid are taught.
., Ekins et al., 1992, and Ann.Biol.Clin. -- volume [50th] : 337 - 353 pages of a multiplex analytic microspot and immunoassays are taught.
., Wilding et al., 1994, and Clin.Chem. -- volume [40th] : 43 - 47 pages of operation

information of the fluid on the straight-line channel by which micro machining was carried out into silicone are indicated.

The synthetic microchip for the advanced technology to perform [ultramicroanalysis / and] the super-minute amount resultant method is indicated. One fault in the ultramicroanalysis method and device of the advanced technology was the difficulty in designing the system for moving a fluid on a microchip through the channel and reservoir which have a path of 10-100micrometer within the limits. In order that the device indicated with the advanced technology might perform an ultramicroanalysis, needed to unify individual data analysis and a storage in one device, but. The complexity of the device designed in order that the pliability or usefulness of these devices might use a microchip by it, without increasing subordinately increased superfluously. Then, it was [for / which is biological and biochemical and performs chemical analysis and composition / moving a fluid within the structural constituent of a microsystem platform] simple, was flexible, and could be trusted, and the necessity for the quick and economical object for ultramicroanalysises and the reaction platform for super-minute amount composition remains. Such a platform must be able to move the fluid of the amount of microliter from the nano liter which contains a reagent and reacting matter at a quick speed suitable for carrying out effectively separation of proper mixing of a reaction component, removal of reaction byproducts, a required resultant, and an intermediate product. In order to perform effectively the interface of data with fluid movement, thermal control, reagent mixing, reacting matter detection, data capture, data analysis, and a user, and a system, the device for operating a microsystem platform is also needed further again. Such a device is refined in another embodiment (for [like / For example, / a hospital] specialists).

Directions are easy, and (for [like / For example, / home monitoring] consumers) what is been a portable type (for [like / For example, / an environmental inspection] the spots) is needed. Such a device combines the capability of "wet" chemicals with information processing, memory, and manipulative capability still more beneficially.

Abstract of an invention This invention provides the ultramicroanalysis super-minute amount resultant system with which it was unified with being extensive for biochemical [biological and] and carrying out chemical analysis on the ultramicroanalysis scale. The device and method for carrying out the process of such an ultramicroanalysis scale on a micro platform including that this invention moves into the channel with which it was stimulated by the centripetal force which a fluid generates from rotation of a platform, and was limited on the platform are provided.

In one mode of this invention, an ultramicroanalysis super-minute amount resultant system including the combination of two elements is provided.

The 1st element is a micro platform of revolving structure which is a disk most preferably, and said disk includes a sample flow entrance, a fluid micro channel, the reagent reservoir, the

reaction chamber, the detection chamber, and the sample flow exit at this time. A disk is rotated at the rate of about one to 30,000 rpm in order to generate the centrality acceleration which enables fluid movement. The disk of this invention includes the liquid stream entrance, the exhaust port, and the ventilation channel preferably further again. The sample can flow in a disk by a liquid stream entrance for processing and/or analysis. A means for a fluid to exhaust [an exhaust port and] air, especially as for a ventilation opening is provided, and movement by which the fluid on a disk is not controlled by this is guaranteed. The specific part on a disk includes the element which can analyze preferably the fluid containing a heat source, a light source especially a monochromatic light source, sound sources, and the detector to these effectors of each again. Instead, a part or all of these elements can be included on the 2nd disk that is optically connected with the 1st disk or is carrying out direct contact physically.
The 2nd element of this invention is a micro manual operating device which are the disk player/leader device which controls the function of a disk. This device contains the mechanism and drive which make it possible to carry out loading to a disk and to rotate. A keypad and a computer display are used preferably, a user operates a microsystem on a disk, and this device provides the means for accessing data and analyzing it.
This invention provides the method and device for operating the sample which comprises the fluid, cell, and/or particles containing the analyte. Although the micro platform disk of this invention contains a sample flow entrance, a micro channel, a chamber, a valve, a warmer, a condensator, electrophoresis, and a detection system, it contains on the disk the microsystem which comprises what is not limited to these. Although the movement of a sample can exhaust air, it becomes easy by incorporating the air vent which prevents the fluid after acceleration, and/or the loss of particles also wisely, and an exhaust air channel.
The desirable embodiment of the disk of this invention is incorporated on the substrate by which micro machining was carried out and which is mechanical and optical and is preferably made from a plastic, silicon, quartz, metal, or ceramics in fluid study control structure (or "system"). Such structures are constituted from the scale below a millimeter by a photograph plate, etching, Stamping, or other suitable means.
Movement of a sample is controlled by centrality or linearity acceleration, and alternative operation-ization of the valve on a disk.
In the desirable embodiment of this invention, the portion of the disk is carried out only for information processing by standard reading-and-writing digital technology. The data produced as a result of processing and analysis is recorded on a disk surface using a digital recording means. In another desirable embodiment, the read-only memory (ROM) on a disk contains the analysis of disk information, an instruction (command), an experiment protocol, and data and the statistical method which can be accessed when a user operates a disk.
In detection of the analyte containing composition, analysis and fluid, especially biological

liquid of a fluid, an extensive use is among the micro manual operating devices which make possible the process and such a process of the fluid transportation by centrality acceleration. It carries out within the reaction chamber on a disk by alternative opening of the reagent chamber which chemical and a biochemical reaction follows according to a small tube and a mechanical or thermal valve system. The contents of those chambers are carried in a reaction chamber with the application of centrality promotion. After that, a resultant is asked with the detection system used as a reagent for the reaction which continues with a detection system, or can be collected.

In the following chapter and drawing of this application, the desirable fixed embodiment of the device of this invention is explained more to details.

The easy explanatory views 1A (top view) and 1B (side view) of a drawing, The reservoir in the disk containing the micro platform of this invention (12, 14, 18, 20), The arrangement of a valve (13, 15, 17, 19, 21, 23, 25), a reaction chamber (16, 22, 24), an inflow and a tap hole (11, 32), and a vent (29, 33, 34, 35) is illustrated.

Drawing 1 C shows the arrangement of many microsystems on a disk.

Drawing 2 A is a graph and drawing 2 B is a schematic illustration of the arrangement of the channel on the disk of this invention currently explained in relation to the equation 5.

Drawing 3 A is a graph and drawing 3 B is a schematic illustration of the arrangement of the channel on the disk of this invention currently explained in relation to the equations 12 and 13.

Drawing 4 A is a graph and drawing 4 B is a schematic illustration of the arrangement of the channel on the disk of this invention currently explained in relation to the equation 14.

Drawing 5 A, and 5B and 5C are graphs, and drawing 5 D is a schematic illustration of the arrangement of the channel on the disk of this invention currently explained in relation to the equation 15.

Drawing 6 is a schematic illustration of a piezoelectricity stack micro valve.

Drawing 7 is a schematic illustration of a pneumatic pressure operation type micro valve.

Drawing 8 is a schematic illustration of the device for sending pneumatic pressure to the disk under revolution.

Drawing 9 is a schematic illustration of the micro valve made from bimetal.

Drawing 10 is a schematic illustration of a pressure-balancing type micro valve.

Drawing 11 is a schematic illustration of a polymers relaxation micro valve.

Drawing 12 A and 12B express two sorts of embodiments of the fluorescence detector of this invention.

Drawing 13 A, and 13B and 13C are the schematic illustrations of the multiple loading device for a disk.

Drawing 14 A to 14F shows the laser beam operation type CD-ROM capability of the disk of this invention.

Drawing 15 is a process flow sheet of the processor control structure of the player/leader device of this invention.
Drawing 16 is a schematic illustration of a crossing spectral detection chamber.
The versatility of the disk of this invention constituted for DNA sequencing of drawing 17 A to 17E is structural, and it is a schematic illustration of a functional layer.
Drawing 17 F is a basic partition for the disk for analysis, and a schematic illustration of a design format.
Drawing 17 G is a schematic illustration of the disk constituted as a disk for home inspection diagnosis.
Drawing 17 H is a schematic illustration of the disk constituted as simple immunity capacitance assay.
Drawing 17 I is a schematic illustration of the disk constituted as the object for gas, and a disk for particles.
Drawing 17 J is a schematic illustration of the hybrid disk include the chip assembled individually.
Drawing 17 K is a schematic illustration of a sample authorization disk.
Drawing 17 L is a schematic illustration of the disk constituted for the pathological use.
Drawing 17 M is a schematic illustration of the disk provided with the removable assay layer.
Drawing 17 N is a schematic illustration of the disk for assaying an aerosol.
Drawing 17 O is a schematic illustration of the disk for flow cytometry.
Drawing 17 P is a schematic illustration of the disk for a microscopic inspection use.
Drawing 17 Q is a schematic illustration of the disk for an immunoassay use.
Drawing 17 R is a schematic illustration of the disk for thin layer chromatography.
Drawing 18 is a schematic illustration of the disk constituted for hematocrit determination.
By SPLITT of a constituent of blood, since it is another, drawing 19 is a schematic illustration of the constituted disk.
Drawing 20 is a schematic illustration of the disk constituted as DNA melt meter.
Drawing 21 is a schematic illustration of the disk constituted for DNA amplification.
Drawing 22 is a schematic illustration of the disk constituted for automatic restriction enzyme decomposition of DNA.
Drawing 23 is some schematic illustrations of the disk microsystem constituted for DNA synthesis.
Drawing 23 B is a schematic illustration of the disk constituted for much DNA oligonucleotide synthesis.
Drawing 24 is a schematic illustration of the disk constituted for DNA sequencing.
Drawing 25 is a schematic illustration of the disk constituted for iron assay.
Drawing 26 is a schematic illustration of the disk constituted for the stationary-phase reaction.

Drawing 27 is a schematic illustration of the disk constituted for sample extraction.
Drawing 28 is a schematic illustration of the disk constituted for capillary tube electrophoresis.
Drawing 28 is a schematic illustration of the disk constituted for gel electrophoresis.
Drawing 29 is a schematic illustration of the crossing optical path in a micro platform.
Drawing 30 is a block diagram of the flow of the process at the time of controlling the informatics of this invention.
Drawing 31 is a more detailed schematic illustration of informatics control of this invention.
Drawing 32 is a further more detailed schematic illustration of informatics control of this invention.
Detailed explanation of a desirable embodiment This invention provides the micro platform and minute manual operating device for performing microprobe analysis of a biological sample, chemical sample, and environmental sample and an industrial sample, and minute composition assay. In the purpose of this invention, the term of a "sample" is arbitrary target chemical species or granular kind, and is understood to mention the thing which isolated, the thing detected as an ingredient of a more complex mixture, or the thing compounded from the precursor kind. The pivotable micro platform whose this inventions are analytic / resultant minute volume assay platform (it is intensively called a "disk" here), And the combination of the minute manual operating device for operating a platform so that fluid movement on the platform produced from the centripetal force on the platform as a result of rotation may be attained is provided. Although it is preferably advantageous that it is a circular disk as for the platform of this invention, the arbitrary platforms which can be rotated so that centripetal force may be given to the fluid on a platform shall be contained in the range of this invention.
The micro platform of this invention (it is preferably called a "disk" intensively after this, and) In the purpose of this invention, a "micro platform", a "microsystem platform", and a "disk" are compatible terms. It is provided so that 1, two or more minute composition, or a microprobe analysis system may be included. Such minute composition or a microprobe analysis system includes the combination of the related ingredient which indicates between ingredients still in detail here where interconnection is functionally carried out so that it may be made to flow through a fluid at the time of rotation of a disk. These ingredients can be assembled like the statement to the following as a module which was attached and placed, and it was contacted by the disk, and one or a disk, or was embedded on it. This invention is a minute manual operating device for operating the disk of this invention, and also contains the device which a disk rotates within a device so that the centripetal force for making it flow through a fluid on a disk may be provided. Therefore, the means for rotating this device with the revolving speed by which the disk was controlled, and making rotation of a disk suspend and start, and transforming the hand of cut of a disk advantageously is provided. Both an electromechanical means and a control means are provided as an ingredient of the device of this invention so

that it may indicate still in detail here. A user interface means (for example, a keypad and a display) is also provided.

This invention provides the method and device for operating the sample which consists of the fluid, cell, and/or particles (it is named the "sample" generically here) containing the target analyte. The platform of this invention The micro channel for a sample inlet port and a fluid stream, A reagent reservoir, a mixing chamber, a reaction chamber, an optical reading chamber, The valve, the temperature control element, the isolation groove, electrophoresis slot, and electrode for controlling the fluid stream between ingredients, The mixing means containing an air-outlet port, a sample exit port, output exit port; magnetism, a sound wave, and a mechanical mixer; it consists of a power supply source inside the plane like a battery or an electromagnetism dynamo, and a system which is liquefied and contains a dry reagent and other ingredients which are statements or are known by the person skilled in the art here. Although a motion of a sample moves air, the fluid at the time of acceleration and/or the loss of particles become easy by incorporating skillfully the air vent or air replacement slot to prevent. Preferably, a disk is [like a minute assembling machine on the platform which consists of a plastic, silica, quartz, metal, or ceramics, for example] optical, and incorporates a fluid control component. The term of a "minute assembly" as used in the purpose of this invention means how to make such structures manufacture on a scale of less than MIRIMETA. These methods contain other means by which it was well known to photo lithography, etching, Stamping, and a person skilled in the art, although limitation is not carried out.

Movement of a fluid (a reagent, a sample, and other liquefied ingredients are included) is controlled by the centripetal acceleration by rotation of a platform, and selective activation of the valve which controls connection between the ingredients of the microsystem of a platform. Although the grade of centripetalism acceleration required to make it flowing through a fluid under a speed suitable for a special microsystem and a pressure is decided by the factor containing the degree of position angle to the hand of cut of the effective radius of a platform, and the structure on a platform, and the revolving speed of a platform, It is not necessarily limited to these.

It is carried out within a reaction chamber by opening selectively the micro valve by which chemical and a biochemical reaction controls the receipts and payments to a contiguity reagent reservoir. The micro valve explained in detail by the following contains a mechanical valve, an electric valve, a fervent speech mechanism, and the capillary tube micro valve by which a fluid stream is controlled by relation between a capillary tube suction force and the centripetal force which is acting on a fluid. The contents of a reagent reservoir connected to a reaction chamber through the micro channel controlled by such a micro valve are sent to a reaction chamber by the rotation of a micro platform performed by harmonizing, and opening of a suitable micro valve. The quantity of the reagent sent to a reaction chamber is controlled by

time which the valve to a rotational speed and reagent reservoir has opened wide. Similarly, by controlling and opening the micro valve in a reaction chamber, the output of the reaction performed within a reaction chamber is removed from a reaction chamber, and is sent to the arrangement for analysis, the 2nd reaction chamber, or an output exit port.

The analysis array constitution ingredient of the micro platform of this invention contains detection, a monitor, a fixed quantity, or the detection system for analyzing for a reaction path, output, or a by-product.

A useful detection system contains fluorescence, chemical fluorescence, quantity of heat, and electrochemical and a radioactivity detection means, although limitation is not carried out in this assembly and use of the micro platform of this invention. If it requires, a detection system contains in a platform the ingredient of the device which operates a platform made into one, or can perform the both.

That is, the micro platform and minute manual operating device which are provided by this invention provide analytic or resultant data which should be processed. Data processing is attained with the processor or memory module on a disk by a device microprocessor and a memory, or the external computer connected to the minute manual operating device.The dismountable media for data retrieval and storage are provided by that of disk **, or a device using a computer diskette, a tape, or optical media. It is an exception method and data is written on a micro platform, using CD ** / writing art, and the conventional optical data storage system as an advantageous thing. In such a mode, data is written to a micro platform with the platform down side opposite to the "humidity" chemicals side which hold various microsystem ingredients of an indication here.

The physical diameter of the micro platform of this invention changes broadly. When provided as a disk, disk radiuses are 1-25 cm, and disk thickness is 0.1-100 mm more preferably 0.1 mm - 10 cm. The most advantageous desirable embodiment for manufacture of the disk of this invention, and operation, The size within 1 or the format beyond it which exists beforehand. : which it has. (1) A radius. A 3-inch compact disk [in about 3.8 cm] about 1 mm thick. (CD) 2-mm-thick 12 inch CDV [2-mm-thick 8inchCDV(in commercial scene, called "laser vision" disk); and (4) radii in 10 cm / in 15 cm]. [a 5 inch compact disk; (3) radius /; (2) radius / in about 6 cm / about 1 mm thick]

The size of a micro channel and a stores dept. is decided the optimal with a specific use, and the quantity and reagent distribution speed of a reagent required for the microprobe analysis of this invention, and each specific mode of a minute synthesizing method. In a microprobe analysis use, a disk size can have preferred 5-inch CD (6 cm x 1 mm), and, thereby, a reagent reservoir can be included to 0.5mL (close to the actual value replaced by a disk).

A micro channel size may be to about 1 mm in thickness of 0.1 m - a disk. A micro channel and stores dept. shape may be a trapezoid and other circular or required geometric-like shape.

The cross section size of the micro channel which a micro channel is preferably embedded into an about 0.1-100-mm-thick microsystem platform, and crosses the width dimension of a platform is smaller than 500 micrometers, and are said 1 to 90% of cross section sizes of a platform. A reagent reservoir, a reaction chamber, a detection chamber, a sample inlet port, and an exit port, The cross section sizes of the micro channel which is embedded into an about 0.1-100-mm-thick microsystem platform, and crosses the width dimension of a platform are said 1 to 75% of cross section sizes of a platform.

An inlet port and an exit port are the ingredients of the micro platform of this invention useful for introduction of removal of various fluid compositions. An inlet port is provided in order to put a sample and a reagent on a disk or to pour them in into a disk, and this type of port is usually arranged toward the center of a disk. An exit makes air run into the "muffler" on a disk, or a "baffle" system advantageously, and it is provided in order to make it possible to move without controlling a fluid on a disk. An air replacement slot is also included in a disk absentminded affectation treatment system, and thereby, through the slot linked to a fluid content micro channel, a motion of a fluid replaces air so that it may back towards a motion of a fluid, it provides positive pressure by that cause, and activates a motion of a fluid further. An exit port is also provided in order to remove output from a disk. The shape of a port and a design change depending on a specific use. For example, especially a sample inlet port is designed draw a sample efficiently into a disk by capillarity. A port can be made into shape which makes possible an automatic sample / reagent load, or product removal. An entrance and an exit port are arranged most advantageously, and are provided, and a busy sample is applied to a disk using the administration tool designed specific by that cause. The similar tool designed remove output from a micro platform is useful. The typical arrangement of a sample port, a ventilator, a reagent reservoir, a reaction chamber, and a micro valve is shown in drawing 1 A - 1C.

It depends for various disk ingredients and the functional and best arrangement of an element on the dynamics of the fluid movement to centripetal force. Centripetal force is a function of the radius of a platform, the revolving speed of a disk, and fluid density. The specific function parameter concerning the microsystem platform of this invention is understood by the following formulas. Since these assume both viscosity and a nonviscous (turbulent flow) loss about the fluid which fully spread flowing, they should show the limit of system performance.

The driving force for moving a fluid or forming the pressure of a fluid is power obtained from centripetalism acceleration. Devices are the angular velocity f (revolution per second) and angular-frequency omega=2pif (1).

It may come out and rotate.

Centripetalism acceleration (along with a radius, accelerated by the radius distance R from the center of uniform rotation disks) is $a_c=omega^2R$. (2).

It comes out. Centripetal force $Fc=ma_c=momega^2R$ (3) turned to the mass m in such uniform rotating operation inside along with the radius of a center of rotation

It ******. When mass is fixed to this radius, it is the origin of the static pressure in the fluid column which the device which has caused rotation provides this power and this indicates below.

When mass is allotted to the upper trap door upper part of the pipe by which orientation was carried out to the radial direction and DORAPPUDOA is opened wide, the inertia force of mass reduces acceleration of a pipe and this serves as a reason for driving a fluid to radial outside on rotation disks.

Rotation generates a static pressure in non-flowing fluid. It is assumed that the column of a fluid is extended from inside-radius R_0. The pipe can meet or incline to a radius from a radius at an angle of predetermined.

The pressure in position R_0 is defined as P_0 which is atmospheric pressure, for example. By integrating with the centripetal force per unit area about the fluid of the density p of position R_0 to R, the overpressure for rotation of the fluid in the position R which is set to $R_0<R$ is seen.

$P-P_0=integralrhoa_c=rhoomega^2/2x\ (R^2-R_0^2)$ (4)

When the pipe prolonged from the center is filled, this pressure is $P-P_0=(2.834x10^{-4})\ pf^2R^2$ (5).

It becomes (as for R, the radii cm and rho are density gm/cm^3 and f= frequency (revolution per second) in the pound (psi) per square inch, and here). That is, a pressure (or centripetal force concerning a fluid) changes in proportion to square of the radius position from fluid density and a center of rotation, and the square of a rotational frequency.

In order to decide the speed of the fluid which is moving all over the slot on rotation disks, the formula of operation of a fluid must be solved. The element of the fluid of the radius a and the length dR which is filling the round groove has the mass dm accelerated.

$Dm=pirhoa^2\ dR$ (6)

The formula of operation for this fluid element is power =(mass) x (acceleration). Power is a capillary tube suction force resulting from a difference of the surface energy between centripetal force, a fluid, a steam and a fluid, and a solid surface, and the diffusing power by the speed of a fluid, and the non uniformity of a flow. A capillary tube suction force can be disregarded and centripetal force and/or the external pressure are understood to be applied in order to push a fluid all over a dry slot. As superfluous evaluation of such diffusing power, both the power of laminar flow in which Newtonian fluid (floor line) fully spread, and the power by an un-uniform style (FD) are contained.

$F=maF_C+F_L+F_D=dma_R$ (7)

$F_C+F_L+F_D=(ppia^2\ dR)\ a_R$ -- a_R is the acceleration of the mass flow element which met the radius here -- $F_C=(ppia^2\ dR)\ omega^2RF_L=-(8micropia^2\ dR)\ u$ (8)

$F_D=-(2ppia^2\ dR)\ u^2$ -- here, mu is speed and u is the radial velocity of a fluid. Two of these latters show the standard mechanism [as / in the end of a slot entrance / exit, or a drip] of the laminar flow which fully spread and has not spread thoroughly. About a slot or a pipe inclined at the angle theta about radius Fc, being indicated as $x(F_C)$ costheta also attracts attention. A final type is as follows.

$(ppia^2\ dR)\ omega^2R-(8micropidR)\ u-(2rhopia^2\ dR) = (du/dt)\ (rhopia^2\ dR)$ (9)
Here, the radial acceleration of a fluid is shown by a_R- (du/dt). This is a differential equation about the fluid rate of flow.
This formula is solved about a specific example. I would like to be able to visualize the drop of the fluid of length L which is moving all over the radial slot longer than a drop.
Since all the fluids in a drop move at the same speed, they may replace dR by L and may replace R by mean-place [of a drop] <R> = (R+L/2).

Deduction of a common factor: $(omega^2(R+L/2)\ /2)\ -(8\ micro/rho\ a^2)\ u-2(u^2/L)=(du/dt)$ (10)
This formula must be solved numerically. The rough value amended by comparison with numerical analysis is obtained. It consists of the negative term of left end portions erasing a positive paragraph almost thoroughly. And right-hand side can be set as 0 and it can analyze by R and the formula obtained about the "terminal velocity" in u0.

$omega^2(R+L/2)\ /(2)-(8\ micro/rho\ a^2)\ u_0-_2(u_0{}^2/L)=0$ (11)

This is four following formulas and is analyzed as follows.

$u_0=-(B+rootB^2+4AC)2A$ (12)

It is here and is $A=L/2B=8\ micro/pa^2$ (13).

C = $(omega^2(R+L/2)\ /2)$ In the conventional device, these are A=2/L, and B=320 micro/rho D^2 and C=(19.74) f (2 R+L), u_0= fluid speed cm / second; L= drop length cm;mu = speed poise;rho = fluid density gm/cm^3;D=2a= pipe diameter cm; and radial direction position cm of R= fluid drop. As mentioned already, the volume of the drop which this formula gives a near speed of the drop of the fluid in a tubular slot, and is obtained as drop length is shorter than the length of a slot. This presumption assumes both viscosity and a nonviscous loss. The speed of a fluid drop increases with the increase in density and drop volume (length), and falls with a speed increase.

Speed increases with the increase in a groove diameter, revolving speed, and a radial direction position.

The fluid speed in the filled slot which connects with the whole chamber in position R_0, and receives a stores dept. in position R_1 defines L in a formula (11), and then calculates a flute length by formula $L=R_1-R_0$. The fluid speed in the inside of the chamber filled as a function of a radius is calculated using the formula (13) defined by the formula (13).

The fluid rate of flow is a product of speed and a groove area.

$Q=u_0pia^2=u_0piD^2/4$ (14)

Here, it is Q= rate-of-flow mL/sec;u_0= speed cm/sec(from formulas 12 and 13 to calculation);, and D= pipe diameter cm.

It depends for time required to let the pipe or slot of length L pass, and move the volume V to a receiver from a stores dept. on whether V is the value (the length of the "drop" of the volume V in a pipe is longer than the pipe itself) that a pipe is filled, or it is not filled by V. In the case of :$Dt=V/Q$ $L<=(4\ V/pi\ D^2)$ which this time is the value which broke the volume V of the fluid by the rate of flow Q in the case of the former, and is the value into which it divided this computation time by the ratio of pipe length and the drop length obtained mostly in the case of the latter (15)

In $Dt=(V/Q)x\ (4piD^2L/4V)$ $L>(V/pi\ D^2)$, Dt is the same time (second) as the thing about the fluid of the volume VmL which flows in the speed QmL/a second here, in order to flow into a receiver from the stores dept. filled through the pipe of length L and the diameter Dcm. The rate of flow Q is calculated by a formula (14) and the expanding type (12) and (13) in the definition of the parameter of a formula (13). The time Dt increases with the increase in the volume conveyed, and falls with the increase in the rate of flow.

A fluid characteristic like a pressure and speed is related with the physical parameter of a disk like disk radiuses and revolving speed as mentioned above. These relations are shown in drawing 2 derived by said formula by $p=1\ gm/cm^3$ and mu=0.001poise - 5 about the water of a room temperature.

Drawing 2 A shows the static pressure in a fluid packed tube with a length [as a function of modification distance (R)] of 30 cm, and a relation with the revolving speed (f) calculated from the formula 5. The arrangement of the pipe on rotation disks is shown in drawing 2 B. He can understand that the pressure of 0-10,000 psi may occur in a pipe in the revolving speed of 0-10,000 rpm. From before, the pressure of this size is used, for example in order to perform high pressure liquid chromatography (HPLC).

Drawing 3 A shows the radial direction speed of the drop of 1, 10, and 100microL which is moving the inside of the 30-cm pipe of a long sky 1 mm in diameter calculated from the

formulas 12 and 13. This pipe is prolonged from the center along with the radius of a disk, and a disk rotates at 100, 1,000, or 10,000 rpm. Arrangement of the pipe on rotation disks is shown in drawing 3 B. The transit time of a fluid drop is calculable using such speed. For example, when the drop of 1microL is in a 2-cm position from the center of a disk revolving at 1,000 rpm, it flows at about 20 cm/sec in speed. Therefore, the time to circulate can calculate a 1-cm pipe with about 0.05 second. (About the pipe by which orientation was carried out to the non-radial direction at the angle of 45 degrees in the hand of cut, speed falls 30%.)

Drawing 4 A shows the rate of flow in the 5-cm fluid packed tube of a different diameter. A pipe is placed on a revolving disk, respectively, and as shown in drawing 4 B, the stores dept. by which orientation was carried out to two radial directions is connected. According to the formula 14, the rate of flow is a function of the radial direction position (in this example, it changes to 2-30 cm) of a pipe, a pipe diameter (10 micrometers, 100 micrometers, 1,000 micrometers), and a rotational frequency (100, 1,000, or 10,000 rpm). (As mentioned above, in the pipe of 45-degree non-radial orientation, a speed fall is 30%.). The drop speed shown in drawing 3 A was calculated by the formula 3, and the rate of flow was decided using the formula 4.

In drawing 5 A, and 5B and 5C, time required in order to convey the drop of 1, 10, and 100microL through a 5-cm pipe, respectively is shown. A pipe connects the stores dept. by which orientation was carried out to two radial directions, as shown in drawing 5 D. Transit time is a position (0-30 cm) of the radial direction of a pipe, a diameter (10 micrometers, 100 micrometers, or 1,000 micrometers) of a pipe, and a function of a rotational frequency (100, 1,000, or 10,000 rpm). The curve shown in drawing 5 A, and 5B and 5C was calculated using the formula 15.

If it combines, these formulas and graphs show the relation between a fluid characteristic like disk radiuses, revolving speed, a flute length and a diameter, the speed in fluid speed determination, and density, and the rate of flow on a disk. Assumption which supports these change includes the viscosity loss by a Poiseuille (nonturbulent flow) style which added the loss by the non-homogeneity style of a drop in the entrance and exit port of a pipe. These ****** graphs provide low restriction of speed and the rate of flow. Fluid speed changes in 1 cm/sec or less to 1,000 cm/sec or more, and the fluid rate of flow may change less than from 1 pL/sec at the revolving speed of 1-30,000 rpm at tens mL(s)/sec. By combining the diameter of a slot, and the position on a disk, a fluid transfer can be performed in various methods in a ms - several hours, and tens of wide range hours.

Disk covering and presentation The constituent containing the micro platform like a disk and such a platform is advantageously provided so that it may have the suitable various presentations and surface coating for the specific use in the wide range use of an indication here. A disk presentation is a function of a structural required factor, a manufacturing method,

and reagent conformity / chemoresistance characteristic. Especially Inorganic crystal nature or amorphous material, for example, silicon, silica, quartz, Organic materials like metal to a plastic, for example, poly (methyl methacrylate) (PMMA), The disk which consists of acetonitrile butadiene styrene (ABS), polycarbonate, polyethylene, polystyrene, polyolefine, polypropylene, and metallocene is provided. These can be used together with un-denaturalizing or the denaturation surface so that it may indicate below.

One vital-structures consideration in an assembly of the microsystem disk of this invention is a mechanical defect by stress in use. The defective mechanism of a disk revolving at high speed, As indicated in Hertzberg work (1989, Deformation and Fracture ofEngineering Materials, the 3rd edition, Wiley & Sons:New York) as a result of **** load, Or the destruction which may be generated by cracking or abnormal occurrence is included.

These defects are produced when the stress (defined as the load per unit area) by rotation of a disk exceeds a critical value characteristic of the material used in order to make a disk. For example, the "load" in the arbitrary points in a disk is the tensile force by the rotation in the predetermined radius on a disk, and a full load, It is centripetal force required in order to maintain the material of a bigger radius as it is moving circularly, and load / area, i.e., stress, is this power broken with the total area (thickness of a 2pirx disk) of a disk. The critical value of the stress which a defect produces into material is called a yield value, and it is dependent on existence of the defect (it is (like the crystalline defect in silicon or plastic substrate material)) in the adhesive power which maintains material together, and material. Although material without a defect is separable, small defects occur frequently by cracking or "unusual formation (crazing)" (for example, defect of a plastic vitrified to plastic modification and the beginning). For example, the yield strength of commercial silicon permits rotating 30 cm disks at 10,000 rpm without a mechanical defect, when the total thickness of a disk has a diameter of an inside slot and a chamber smaller than about 80%. in the disk made from a plastic, the stress on a disk usually declines with the low density (load/-- area is only reduced) of a plastic. however, yield strength is smaller than silicon figures double [about] (Luis & Yannis work, Computayional Modeling of Polymers, and (Bureitz, ed.).) It is explained in detail by Marcel Dekker:New York. .

One solution of this problem. [whether a 30 cm plastic disk is rotated more with a low speed (for example, 1,000 rpm), and] It is provided by what is made to increase the size of disk radiuses (for example, a 4-cm plastic disk is used about the use which needs the revolving speed of 10,000 rpm). That is, in order to give the restraint about the presentation of a disk to a disk functional characteristic and the feature, selection of a specific material for a specific use is enough.

The reagent solution in which the disk material in contact with a fluid has also received the rotation stress at the time of heating and cooling. Resistance must be shown to the exposure

(it generates, when the specific detection means of a statement is especially used for below) by degradation by (for example, the buffer solution of acetonitrile, polyacrylamide, and high or low pH) and high intensity ultraviolet rays, or visible light. The surface exposed to the reagent and the reaction mixture (for example, a micro channel, a stores dept., and a reaction chamber) must have a suitable desirable surface characteristic for each use. Silicon, silica, and quartz are materials especially desirable as a material of a micro platform assembly. Silicon and its oxide (intrinsically silica), Some peroxides (for example, mixture of hydrogen peroxide and sulfuric acid), hydroxide. (For example, KOH) and hydrofluoric acid (HF) are combined with independent or an alkali system nitrate, And various fault fluorination solvents (for example) By SF_6. It is attacked by the chisel chemicals target (see The Chemistry of Silica, Wiley & Sons:New York;Properties of Silicon, the X version, INSPEC:, London, and 1988 in Iler and 1979). Silicon system material is inertness chemically to aliphatic series and aromatic hydrocarbon (for example, a tetrahydrofuran, toluene, etc.).
When it exposes to water and a neutral water solution, it is inertness substantially.

In order to assemble the microsystem platform of this invention, various polymer system (plastic) materials are preferred. Poly (tetrafluoroethylene) (PTFE) which is polymer of chemoresistance nature most is easily machineable although melting processing cannot be carried out. PTFE is inertness chemically substantially.
It can use for most uses using strong acid, a base, alkali, a halogenated solvent, or other strong chemical agents.
Rather than PTFE, other fluoropolymers (for example, FEP, PFA) are processed more easily, and maintain most chemoresistance nature of PTFE. Although :, for example, polyimide, which can choose the material processed more easily so that it may have selective resistance shows resistance highly to alcohol, alkali, aliphatic hydrocarbon, and a base (for example, NaOH), The resistance over the partial halogenated solvent (for example, dichlorobenzene) is inferior. Although poly (VCM/PVC) shows resistance strong against oxidizing acid and aliphatic hydrocarbon, its resistance over aromatic compounds is weak. Much material which does not show advanced resistance to the thick material of a specific chemical shows sufficient resistance to a rare solution, or shows sufficient resistance for a single using device (for example, polyamide and polyimide can be used together with the diluted solution of specific acid like acetic acid and chloride).
Specific chemical / polymer combination are a formamide, a lutidine and acetonitrile, and a non-aromatic compound and nonpolar polymer (polypropylene, polyethylene).; Dichloromethane, polymer BONETO, and aromatic polymer (polystyrene); ethanolamine and dimethyl sulfoxide, aliphatic series, and non-aromatic polymer (poly (methyl methacrylate), polyimide, polyamide) are included. Fluoropolymers show resistance to said all chemical

agents. Pyridine, tetrazole, trichloroacetic acid, iodine, an acetic anhydride, N-methylpyrrolidine, Other solvents and reagents for N,N-diethylpropylethylamine and piperidine to be included, Fluoropolymers and a part of solvent-drag nature polymer, For example, it is suitable for using together with PVC (Encyclopedia of Polymer Science and Technology, 2nd edition ., the 3rd volume, 421 pages - 430 pages, Xed., John & Sons:New York, 1989).
The combination with little some such a material shows sufficient pliability for any uses substantially.
The surface characteristic of such materials is correctable for a specific use. For example, the suitable surface denaturation can promote or control a cell and/or protein absorption.
Silanizing, ion plantation, and inert gas plasma (for example, gas which the electrical and electric equipment passes and ionizes) can attain surface denaturation. A powerful relation is attained between a water contact angle and cell adsorption, and a hydrophilic surface shows cell adsorptivity quite lower than a hydrophobic surface (refer to : with a Biomaterials of volume [15th] 725 pages in Ikada and 1994). Silicon, silica, and quartz present a peculiar high energy hydrophilic surface. Change of surface specification is attained by hydroxylation (attained by the NaOH processing in an elevated temperature), or silanizing. If there are not Silang and a siloxane as if, it is suitable for especially making the hydrophilic nature of a hydrophobic surface increase. These compounds consist of one or some reactant head groups which are combined with the core region (-CH_2O-) of a substrate, for example, an alkane, (chemical or hydrogen bond). These compounds also provide the course for a bigger change (change by the functional group for acquiring the target surface characteristic) than that of a surface characteristic. It can introduce into the surface which contains vinyl, phenyl, methylene, and a methoxy group for such various functional groups, and the surface which provides a mixed functional group. It not only changes the characteristic of the whole like a fluid angle of contact, but the part of alternative adsorption of a molecule provides these functional groups as itself or a result which combines specific binding groups, such as peptide and an antibody, further.
Silanizing is attained by being immersed in solution at a slightly high temperature in many cases. The chemoresistance nature of Silang and a siloxane tunic is decided with the character of the combination in a chemical admolecule (: with Arkles, 1977, and a Chemtech of volume [7th] 125 pages). When such hydrophobic specification contacts organic Silang in strong corrosive acid, period maintenance is carried out and it should be observed that the remarkable thing with possible single use or restrictive use is shown in such environment.
A plastic system disk can also be easily processed so that a required surface characteristic may be attained. In order to change surface energy by forming the fault fluorination surface for the hydroxyl group **** surface for a surface complex, for example, a hydrophilic increase, or a hydrophobic increase, inert gas or reactant gas plasma is generally used. Surface graft polymerization is the art in which it is used in order to carry out the graft of polymer or oligomer

which has a desired surface characteristic to the substrate polymer chosen for the large-scale processability and fabrication property like a plastic. The method in the commercial scene for starting graft polymerization, Gamma irradiation, laser radiation, heat or mechanical processing, photochemical processing, plasma, and humidity chemical processing is included (further). It is indicated to 675 pages - 689 pages in Encyclopedia of Polymer Science and Technology, 2nd edition ., (Supplement), Wiley& Sons:New York, and 1989. . The chemical denaturation of a polymer surface (suitable polymer) includes oxidation (polyethylene), reduction (fluoropolymers), sulfonation, dehydration halogenation (poly (vinylidene fluoride) dehydration fluorination), and hydrolysis. Although surface chemical nature changes with chemical denaturation, a mechanical property, endurance, and chemoresistance nature are mainly the functions of a substrate plastic. for example, the poly (ethylene glycol) formation of a surface graft of a up to [polyethylene] -- hydrophilic nature -- it is (polyethylene is a difference) -- water is provided with the surface which is resistance (polyethylene is not fusibility although PEG is fusibility in itself at water). Finally, if various surface energy / chemical combination are performed, the organic polymer surface can also be silanized.
The thing containing the "layer" of the microsystem disk which the mode containing a thin film disk was provided and was accumulated on the solid support material saves a disk, and it is useful effectively and at a low price to the continuation assay using the microsystem which contains a disk as what can be consumed. It illustrates to drawing 17 L of such a disk. Such a disk can be uniquely checked by printing a bar code on a disk, for example.
The special example of the disk assembled for various uses is shown in the following examples.
Disk associated equipment and element It provides in the microsystem platform (micro platform) of this invention by assembling two or more ingredients inside the plane directly on a disk, or placing them on a disk as a module assembled beforehand. the one ingredient of a disk -- in addition, a specific device and element are arranged on the outside of a disk -- if it requires, on the device of this invention, arrangement or a disk can be made to be able to contact and it can place.
1. Temperature control element A temperature control element, especially a heater element contain a heat lamp, a direct laser heater, a Peltier heating pump, a resistive heater, an ultrasonic heater, and a microwave excitation heater. A cooling element contains other ingredients, in order to carry out facilitating of the Peltier device and a heat sink, a radioactive heat fin, and the radioactive heat loss. On the whole, a heat plant is applicable to the specific region of a disk on a disk. A heat element is directly assembled on a disk, or it can assemble independently and it can be unified on a disk. A heat element can also be arranged on the outside of a disk. The temperature of the arbitrary specific fields on a disk is monitored by infrared appeal using a resistance temperature device (RTD), a thermistor, a liquid crystal

double reflex sensor, or IR-singularity detector. The temperature in the arbitrary specific fields of a disk is controllable by a feedback control system. A minute scale heat control system is controllable by the system which is directly assembled on a disk and which assembles on a minute chip, and unites with a disk, or has been arranged at the outside of a disk.
2. Filter They are maintenance or a filter which carries out facilitating, screen structure, and other means selectively about passage of the granular material containing the cell applied to the microprobe analysis or the minute composition disk of this invention, a cell agglutination thing, a protein aggregate, or other granular materials. Such a filter means, . Are directly assembled in the fluid handling structure on a disk (e. g. and United States patent No.5,304,487; international application public presentation No.WO93/22053; ., Wilding et al., 1994, Automat.Analyt.Tech. 43 pages - volume [40th] : 47 pages). Or the minute screen structure which is assembled separately and unified in fluid handling structure is included. The diaphragm orifice of a fixed range is provided, and if it requires, this screen structure will be continuously allotted so that a sample may be divided on the basis of the size of the component part of a sample.
The filter of other types includes the material from which a sample constituent is selectively removed on the basis of the electrostatic force between a filter material and a sample constituent. The electrostatic constituent of screen material may be given by the electric charge which is peculiar to material or is sent to material through an electric circuit. Adjusting combination or the presentation of buffer solution, and ionic strength irreversibly, or by correcting the electronic state of material in the case of the charge of an electric control material, the material caught with the filter material can be eluted selectively, and can be given to the further processing.
In another mode of the filter of the microsystem platform of this invention, The characteristic ingredient of a sample can be held to the predetermined section, micro channel, or stores dept. of a disk of this invention by an interaction with the specific protein derived so that it might be held all over the surface of the ingredient of a disk, peptide, an antibody, or fragmentation. By processing with ionic strength buffer solution suitably selected using the conventional method which was immunological or was developed for chromatography art, the material caught by such specific combination can be eluted from the surface of a disk, and can be sent to a collection stores dept.
this invention -- the section of a micro channel -- or the entrance and exit port of a chamber also provide the compartment defined by the chamber defined with a filtration apparatus, or the stores dept. In a specific mode, the chamber defined in this way contains a reagent like a bead and the bead especially covered with an unnecessary contaminant, an intact reagent, reaction byproducts or other compounds, and a compound like the antibody which has compatibility in the final product. In use of the disk containing such a filter restriction chamber, the centripetal

force of a revolving disk removes the fluid containing the mixture of a required compound and an unnecessary compound through a filtration chamber. That is, an unnecessary compound is combined with compatibility material and a desired compound is probed from a chamber by the fluid stream moved by centripetal force. A desired compound can be held in such a filter restriction chamber, and can probe an unnecessary compound. In these modes, the distillate from a chamber by opening a valve is provided.

3. Mixture Various mixing elements are contained advantageous in the mode of the microsystem of this invention which needs to mix an ingredient within a reaction chamber in the case of the addition from a reagent reservoir.

It is incorporable into the fluid handling structure of a disk by applying a processed surface to the chamber which contains a micro channel or a mixer for a settlement mixture. Two or more slots can be mixed by the position on a disk, and those ingredients are mixed by operation of the centripetal force given with the hydraulic power operation given by the processed surface of the mixed slot or the chamber, or rotation disks together. Mixing can be attained also by stirring a disk physically by changing a hand of cut promptly and the system of the outside of a disk.

In another mode, a fluid is mixable on the disk of this invention using a flexible plate wave (FPW) device (refer to United States patent No.5, 006 and 749, and the writing in White work and 1991). Aluminum and the piezo-electric zinc oxide transducer which were arranged on one end of the very thin thin films are used for a FPW device. A transducer generates and detects the sound wave plate waves which spread along with a thin film. The hardness of a thin film and the mass per unit area determine Itanami's speed. If it connects with amplifier, a wave will form the delay line vibration proportional to acoustic wave velocity. It has been used, in order that adsorption of a pressure, acceleration, an organic chemistry substance steam, and protein, the density of a fluid, and speed may detect and the structure based on a FPW phenomenon may mix a fluid together. It unites with a disk, or DERISUKU can be approached, and a FPW device can be arranged, and can mix a fluid composition within the special reaction chamber on a disk.

4. Valve system Typically, control of a motion of the fluid on a disk and movement includes use of a valve system (micro valve) which permits or prevents a motion of the fluid between ingredients. The example of such a micro valve as indicated by Nakagawa and others (1990, Proc.IEEE Workshop of Micro Electro Mechanical SysteTns, Napa Valley, CA.89 page), The schematic diagram of such a valve is shown in drawing 6 including the piezo-electric activator containing the glass plate inserted between two silicon wafers. In this mode, a bottom wafer and a glass plate have one Deguchi slot etched into one or two entrances, and there. The upper part wafer can have a same mind stand surrounding a circular center stand and it. The base of a piezo-electric stack can be put on a central stand, and the topmost part can be

connected to a same mind stand with a circular bridge. The center of SiO_2/SiN_4 arch shape structure is connected to a piezoelectric element. A valve seat consists of nickel or other sealing materials. In the 3 direction modes, a fluid moves to the exit which voltage has not required from a central inlet port. When voltage is applied, a piezoelectric element depresses an arc center, floats an end, intercepts a central entrance, and makes a fluid flow out of an edge part entrance. In the 2-way mode which is an option, if a fluid flows and voltage is applied when not having applied voltage, it will be restrained. In another mode of a 2-way valve, a fluid is restrained when not having applied voltage, and when voltage is applied, a fluid is poured. Also in any of these modes, a piezo-electric stack is maintainable in slant or a rotational plane to a rotational plane in perpendicularity and a rotational plane.

In another mode, a fluid regulator is performed using an air drive micro valve, and the fluid groove is etched into one layer of the material which has the valve seat lifted at the point of control (the schematic diagram of this type of valve is shown in drawing 7). In another layer, a hole preferably corresponding with laser is punched, the hole of a diameter small enough is provided, and, thereby, air receipts and payments are provided. On the 2nd structure, the layer of silicone rubber or other flexible materials deposits by rotation. Next, such structures are mixed. Fluid operation is intercepted by application of the pneumatic pressure which depresses a flexible thin film on the lifted valve seat. This type of valve is indicated in Veider work (1995, Eurosensons IX, pp.284 page -286 page, Stockholm, Sweden, June 25-29). It was shown that the measurement by Velder and others closes the same valve thoroughly with the application of the pressure exceeding a fluid inlet pressure of 30Kpa. This valve can be prepared by being equivalent to 207psig and changing the diameter of air orifices, and the thickness of a thin film layer. As roughly shown in drawing 8, air pressure is put on a disk and such a valve is operated.

As shown in drawing 9, the minute processing gas valve using a bimetal operation system can also perform an air operation. A valve contains the diaphragm actuator which combines in a valve body. An actuator is heated when voltage is applied, and it may really which makes diaphram produce distortion contain a resistance element. This distortion makes the center structure of an actuator act on opening of a valve, and controls the flow of the fluid which passes along a releasing part by this. These valves perform-like-proportionally control based on the input of DC power 0-15V typically. These types of valve is marketed (Redwood Microsystems, Menlo Park, CA;ICSensors, Milpitas, CA).

The mode of the membrane valve which operates with air can contain two disks arranged so that the air operation whose air outlet of one disk include unification of both the ingredients on a single disk, or becomes an orifice of other disks along with the 2nd disk might be made to cause. In which mode, the source of release of air pressure can be sent to a disk via the concentric ring of material like Teflon (r). The erection core and the rotating element are

connected with the disk in this mode. Pneumatic pressure is sent through the inside of an erection core, and is led to the outside end of an erection core by the slot. The slot arranged suitably is processed, and is used as a rotating element, it acts on the slot in an erection core, and pneumatic pressure is led to a gas valve.

The mode of another valve is a pressure equilibrium micro valve shown in drawing 10. This type of valve comprises three layers of material, and two layers of silicon are separated by the film of the electric insulation oxide (for example, silicon dioxide). It is combined with the topmost part of a valve and a glass layer includes an entrance and an exit port advantageously. The central plunger into which it was most put into the main silicon layer is distorted in the gap contained in a bottom silicon layer by applying voltage between silicon layers. When a plunger reduces pneumatic pressure, irreversible confusion of . minute machining part distorted about the gap of a bottom layer is prevented by making the film of Cr/Pt into glazing structure. As a device driven electrostatically, it has many disadvantages including that this type of valve is directly wired in an assembly of a disk. In this mode, an actuator is a device which needs only the minimum input energy for opening a valve also in high voltage comparatively and which was adjusted highly. These types of valve is indicated by Huff and others (1994, the 7th International Conference on Solid-State Sensors and Actuators, pp.98-101).

It is usually indicated [** and here] where a disk and a fluidizer, and conformity are, a single use valve, i.e., a polymer relaxation valve, another type, and it is shown in drawing 11. This valve is based on relaxation of non equilibrium polymer structure. This phenomenon is observed when polymer is extended at a temperature lower than glass transition temperature (Tg), and thereby, nonequilibrium structure is acquired. When Tg is exceeded and heated, a polymer chain is eased, and contraction is observed when structure balances. The common example of this phenomenon is contraction of polyolefine (used for heat contraction canalization or a package).

This polyolefine structure is stable at a room temperature.

However, **** will contract structure, if it heats at 135 **. The example of PR valve polymer contains polyolefine, polystyrene, polyurethane, and poly (vinyl chloride) and specific fluoropolymers, although limitation is not carried out.

One method of manufacturing PR valve is placing a polymer sheet or a lamination on the slot which needs the valve (shown in drawing 11). Next, the stamp between the colds of the cylindrical shape valve is carried out so that a micro channel may be intercepted. A valve is operated by applying localization heat by contact with laser or a resistance heater element, for example. Next, a valve is contracted and a fluid stream is made impossible.

In the disk of this invention, the further type of useful micro valve is a single use valve.

Here, it is a capillary tube micro valve (U.S. Kokubu rate application No.60/00 for which it

applied in August, 1996 (it is indicated and it is taken into reference here) (shown.)).
This type of micro valve is based on use of the rotation induction hydrostatic pressure for conquering a capillary tube suction force. The micro channels containing it (or a stores dept., a reaction slot, a detection groove, etc.)
The fluid which will carry out humidity selectively if it waits for ****** thoroughly, When moving to one big section from the micro channel of a narrow section, the fluid to which the resistance to a flow is shown and humidity of such materials is not carried out resists the flow from the micro channels (or a stores dept., a reaction slot, a detection groove, etc.) of a big section to the slot of a small section. This capillary pressure power changes the degree of angle of contact of the fluid on two the size of micro channels (or a stores dept., a reaction slot, a detection groove, etc.), the surface tension of a fluid, and the materials (or a stores dept., a reaction slot, a detection groove, etc.) of a micro channel, and reversely. Usually, although the details of sectional shape are not important, the micro channel of a size smaller than 500 micrometers will show big capillary pressure power by dependence to a cross section size. By changing the intersection shape of the ingredient of the microsystem platform of this invention, material, and a cross-section area, in order to cause fluid flow, a "valve" is constituted so that it may need to put a specific pressure on a fluid. This pressure is put by rotation of a disk (changing with the grades of square of a rotational frequency, a radial direction position, and a radial fluid is shown previously) into the disk of this invention. By changing the position and grade of the fluid handling ingredient of a capillary tube valve cross section size and the microsystem platform of this invention of having met radially, a capillary tube valve is formed so that it may be dependent on rotation and a fluid stream may be emitted using 100 rpm - the revolving speed of 1000 rpm of numbers. This arrangement can perform two or more steps complex flow processes using the monotone increase of the revolving speed decided beforehand.
Control of the micro valve of the disk provided by this invention is attained by using combining a disk top controller element, a device specific controller, or these.
6. Control system Really [containing a microprocessor and an I/O device] an electronic processing system (it is named a "controller" generically), It is most advantageous on a disk to unify on a disk, after assembling separately, or to be able to place thoroughly in addition to a disk and to consider [which assembles directly] it as the ingredient of a minute manual operating device. A controller can be used in order to control collection of the temperature of a rotation motor (speed, time, and direction) and a system, an optical system, and data, analysis, and storage, and in order to monitor the state of the system of one on a disk. The example of a rotation controller is a controller using the motor controller chip (for example, Motorola MC33035) for the driving direction of the rotation sensor and such a motor which adjoin itself, and speed, in order to decide revolving speed. Such a sensor and a chip are usually used in

closed ring shape using the sensor data for controlling rotation of a disk to a rotation set point. Similarly, the rotary data from these sensors is convertible for analog voltage from the digital arrangement of a pulse using a frequency-voltage conversion chip (e. g., Texan Instrumennts Model LM2917). In this case, an analog signal provides feedback and controls the analog voltage set point corresponding to desired revolving speed. A controller is a method similar to being used in a commercial compact disk (CD) player, and the data coded in the disk data conveyance surface can also be used for it. In these modes, the digital data read by laser is used and revolving speed is controlled by a phase locked loop. As revolving speed information peculiar to the frequency of the read data bit was mentioned above, it can convert into analog voltage.

The controller can also contain the communication ingredient made to access an external database and a modem for the left data movement. Especially a controller can be united with an optical read-out system in order to write in the information which read the information included on a disk and was generated with the analyzing system on a disk into the optical data storage section of one in the disk. In these modes, it is understood as that to which both functions which write it as the function read in the surface which contains the microsystem ingredient of an indication here, and the surface of the disk of an opposite hand are performed.

The information for controlling the arbitrary specific microprobe analysis systems on a disk. Can possess (for example, it is called "information science" to both directions, data, and an intensive target) in the disk itself or the exterior, and most advantageously, It can store in the computer connected to the microprocessor and/or memory of a disk unit of this invention, or the device. . This information controls opening / eyelid completely closure, and timing of a micro valve on a disk. In order to perform logic structure based on the data which unified and collected the data which controls heating on a disk and the cooling element which determine the optimal disk rotational speed, which monitors a detection system, and which was generated by the disk, it is used by a controller.

7. Energy supply The electric demand of the system contained on a disk is sent to a disk through the brush in contact with the terminal area of one at a disk. An electrical link can be built through the point of contact between a micro platform, and the rotary spindle or hub which connects a disk to a rotational driving means. A battery can be united with a disk and electrical-and-electric-equipment supply inside the plane can be provided. A battery can also be used in order to give energy to the device used in order to process a disk. A recharge like cadmium, a lithium ion battery, conventional lead-acid, or an alkaline cell may be possible for the battery used by this invention.

The energy given to a disk may be AC or DC. It opts for an electric demand by the special assay system performed by the disk, and the voltage can change from milli V to kilo V more

preferably from the micro V to the megger V. Current can be made into the range of several amperes from several microampere. Electric supply can be used in order [for ingredient operation] to control and derive a disk top electronic industry material.
An induced current can be generated on the rotation, therefore a disk, and current is provided by the derivation loop or an electric brush. Energy supply can be carried out to the device on a disk using such current.
8. Detector and sensor The detection system for using on the microsystem platform of this invention contains electrochemical [like a spectrum], physical, light diffusibility, radioactivity, and a mass-spectrometric-analysis detector. the spectroscopic-analysis method using these detectors -- electronic spectroscopic analysis (ultraviolet rays -- and it and) [visible-light-] Fluorescence and the number of refractometers, oscillating-component photometric analysis (IR and Raman), and x line segment photometric analysis (x line fluorescence and the conventional x line analysis using a minute processing field emission machine [like] although developed by NASA Jet Propulsion Lab and Pasadena CA) are included.
The typical example for the general detection for using together with the microsystem platform of this invention is indicated below. these are based on a center type (an optical system -- and electrochemical). The detection executive system using the detector of this invention can be formed in the exterior of a platform, and a platform at one at contiguity or a platform.
a. Spectroscopic-analysis method. 1. fluorescence The fluorescence detector system developed for the macroscopic use is known in conventional technology.
It suits so that it may use together with the microsystem platform of this invention.
Drawing 12 A and 12B show two typical fluorescence structures. In drawing 12 A, an excitation source like laser is concentrated on a penetrable section optically [a disk]. It is made to decide with the output or the reagent which occupies the arbitrary stores dept.s of an electromagnetic spectrum to which it appeals the light from a useful portion for the spectral characteristic of light by the exposure of light at the light of a specified wavelength combining a penetrable disk material specifically analytically. It is combinable with the material which has the geometrical form and the refractive index characteristic which serve as total internal reflection of irradiation light in selection of the light in specific wavelength. Two or more reflection depended on detection of the material in the surface of a disk or the sample itself by disappearance nature luminescence is enabled by this, and, thereby, course length becomes quite long.
A suitable structure for a disappearance **** system is shown in drawing 12 A (refer to volume [26th] : Appl.Optics. 2181 pages - 2187 pages in ., Glass et al., and 1987). Fluorescence is returned with the wave guide on a disk, and the efficiency of detection is raised. In these modes, the optical ingredient before a detector may include the dispersibility element which enables spectrum analysis. The size of a noise of fluorescence excitation is a signal.

When not the same as the course length by the same method, it can also be made to increase from the surface by double reflection into a device.
The fluorescence detection structure of another type is shown in drawing 12 B. The light of both fluorescence excited wavelengths and a luminous wavelength is drawn through the one surface of a device. In order to separate excitation and set optical arrangement, the angle of 90 degrees is used. Other angles containing 0 degree can also be used and, thereby, excitation and a luminescence course become the same line top. If a light source can discriminate from a fluorescence signal, the arbitrary optical geometry techniques can be used. The optical range which is permeability is included in the wavelength which is suitable for spectroscopic-analysis measurement and is used at the suitable position (namely, "reading" stores dept. mode of a detection chamber) on a disk. Using this type of fluorescence in a macroscopic system is indicated by Haab and others (Anal.Chem. 1995, 3253 pages - volume [67th] : 3260 pages).
2. Absorption detection Absorption measurement can be used in order to detect the arbitrary analyte to which the intensity of the transmitted light is changed making energy absorb specifically (direct absorption) or by changing absorption of another ingredient in a system (joint absorption).
Optical course geometrical form is designed ensure that absorption detection concentrates on the optical path which receives the peak of the transmitted light from an exposure sample. The exterior of a disk and a disk can be adjoined, it can align, and both a light source and a detector can be moved, or it can arrange to a disk and one. When especially the sample chamber on a disk is used together with the stroboscope lightwave signal which irradiates the detection chamber t with a rotational frequency or its frequency equal two or more times, The cuvette irradiated with and penetrated in the light detected in one passage or passage of multiple times can be constituted. Then, a sample chamber may be a superficial wave guide and the analyte interacts on the surface of a wave guide, Light is absorbed as a result of the weakened total internal reflection (that is, the analyte). For example, when the specific binding to embedding or the compound to which it adhered is used for the chamber surface and it is isolated on the surface of a sample chamber, the analyte reduces the intensity of a light source (refer to volume [61st] : Anal.Chem. 2191 pages in Dassy and 1989).
Indirect absorption can be used by the same optical design. For indirect absorption measurement, when the analyte does not absorb a light source, instead the analyte replaces in a sample chamber, the fall under absorption of secondary material is measured. The transmissivity which increased is equivalent to the concentration of the analyte.
3. Oscillating-component photometric analysis Also in order to generate data from "reading" section of a detection chamber, i.e., the micro platform of this invention, an oscillating-component photometric analysis detection means is provided.

The infrared (IF) optical design is similar to the design parameter mentioned above about the analytical absorption spectroscopy in UV and the visible Mitsunori enclosure of an electromagnetic spectrum, and optimized the ingredient instead of infrared frequency. In such optimization, all the materials in an optical course must penetrate IR light. The structure of the optical ingredient for providing the Raman light diffusion information is similar to drawing 12 A previously indicated for fluorometry, and 12B. However, irradiation time required to generate sufficient signal, therefore the revolving speed of a disk must fall, and, in some cases, must stop. In separated IR or the Raman device which suited by the use for analysis of the disk of this invention, stillness IR or Raman diffusivity analysis is conducted most advantageously off-line.

4. Optical diffusion The turbidity on a disk can also be measured. An optical system and structure are the same as that of absorption measurement. In this analysis, the intensity of the transmitted light is related to the concentration of the optical diffusion particles in a sample. The example of application of this type of detection system is particle condensation assay. If the precipitate particles in rotation disks are large, it is quicker than small particles and the turbidity of the solution in the sample chamber before and behind rotation of a disk may relate to the size of the particles in a chamber. When making small particles condense under existence of the analyte, a turbidmetry can be used in order to detect existence of the analyte in a sample chamber specifically. For example, small particles can be covered with the antibody to the analyte, and, thereby, particles condense them under existence of the analyte as an antibody from one or more particles combined with the analyte. If a disk is rotated after this interaction arises, the turbidity of the sample chamber containing the analyte is low, and a sample chamber ceases to contain the analyte. Measuring of this system can be carried out using a standard quantity of the analyte, and the value of the analyte concentration about the turbidity of the sample which can be set under a standard condition can be provided.

In order to use together with the microsystem platform of this invention, and a device, the optical diffusion detecting method of other types is provided. a light source -- advantageously, the monochromatic light from a laser light source is drawn so that the section field of the flow slot on a disk may be crossed. The lights diffused by the particles in a sample like a cell are collected at an angle of some in the irradiation portions of a slot (refer to volume [66th] : Anal.Chem. 1771 pages - 1776 pages in ., Rosenzweig et al., and 1994).

Since it relates with the result which can interpret a signal, based on a standard like the bead made into the suitable size, data reduction is programmed the optimal and it introduces into a device. The precise discernment between the particles of a different size can be obtained using the assay set of such a bead. Another application of this system is cell biology analysis and an examination including flow cytometry, a cell count, a cell classification, chemotherapeutic susceptibility, and a toxic examination.

b. The electrochemical detection method It is between a sensor element and a sample, or contact between substances like the gas which the balance with a sensor element and a sample was able to take is needed for electrochemical detection. In the case of the direct contact between a sample and a detector, an electrode system is directly made on a disk, and it is moved so that a disk may be contacted after it is attached to a disk before rotation or a disk suspends rotation. If the detector built using a gas steam in order to code the information about a sample is constituted so that a gas steam may contact both a sample chamber and a detector, it can be created with the detector of the exterior of a disk. The electrochemical detector tied up with the disk and the interface, A potentiometer device, voltammetry 1 device, and an amperimetric device can be provided, and the arbitrary electrochemistry transducers which are compatible with the material used in order to build a microsystem disk can be provided.

1. Potential measurement One effective type of an electrochemical detection means is a potential measurement system on the microsystem platform of this invention. Such a system provides a means for the interfacial characteristic of the solution which passes through the flow channel top activated by differing in a meter to be characterized. Considering the character in which temperature control of the micro platform of this invention was carried out, the flowing potential can also be measured with this device (the 260th volume: Reijenga et al., J.Chromatogr. 241 reference). In order to make the flowing potential, the voltage potential difference between two platina leads in contact with a solution is measured by the inner part and lateral part of a disk as compared with a reference electrode. Under the concentric movement by which the fluid was controlled, the flowing potential develops in response to a fluid interaction with the disk surface in the place where it moves as it flows through a channel. Instead, a platinum electrode is used in order to generate electroluminescence ion (see Blackburn et al. and 37:1534-9). And chemical luminescence is detected using one of said optical detectors according to the wavelength of a chemical luminescence signal. The component of a voltameter is also effective on the minute composition platform of this invention, in order to make a reaction intermediate product or a product.

2. Electrochemical sensor The electrochemical sensor is also incorporated advantageous in a disk. In one example, the electrochemical detector which uses an oxidation-reduction cycle reaction is provided (Aoki et al., Rev.Polarogr. volume [36th] : 67 pages reference). This example utilizes the microarray electrode which it is [in the chamber by which micro machining was carried out, including an important kind,] hard, and was put together. This may be attained using duplex-channel potentiostat which a sample oxidizes and enables it to judge the returned chemical state (that is, oxidation reduction), or a chamber may be set up a priori for a certain specific kind.

A lot of fluids containing an important substance are turned to a chamber. And

electrochemically, by energizing an electrode periodically, a reversible kind oxidizes and is returned. In this example, a molecule is detected by the clear rise within oxidation reduction current.
Since an irreversible kind does not contribute the back signal of the 1st cycle, the contribution on the whole to the final signal is controlled. In order to control the signal for an irreversible kind, data analysis software is used.
Each circuit manufactured by photograph lithography in a chamber in another example is 100 micrometers in width, The multi-channel electrochemical detector containing a maximum of 16 circuits with which a circuit pipe serves as a size of 50 micrometers is provided (see : with an Anal.Chem of volume [62nd] the 2206 pages in Aoki et al. and 1992). In this example, a lot of fluids containing an important substance are turned to a chamber. Within a chamber, potential which is different in each electrode is set up so that the separate channel of 16 of electrochemistry measurement may be made. Each electrode potential is swept for every step by a function generator. This protocol produces not only the oxidation reduction current of a substance but the information about an oxidation-reduction potential. Specification of the molecule through voltammogram also enables analysis of this kind.
c. Physical method Use with the disk of this invention is provided also with a physical detecting method. For example, a disk can be used as a viscosity meter. As for the micro channel containing the fluid of the test objective, it is advantageous to provide the bead inserted on the disk. A motion of the bead which passes along a fluid is analyzed, and within a microprocessor memory, it is created and is changed into viscosity data based on the standard memorized (Linliu et al., 1994, and Rev.Sci.Instrum. 65th volume:3824 -28 pages reference).
Another example is a capacitive pressure sensor (Esashi et al., 1992, Proc.).
It is reference about : with a Micro E1 ectro Mechanical Systems of volume [11th] 43 pages. In this example, a silicon substrate and a glass substrate paste up with the standard cave and anode by which hermetic seal was carried out. A pressure is detected by the capacitance change between silicon barrier membrane and the aluminum electrode formed on glass. It can provide in the control electronics which could accumulate the output of the converter of frequency on the silicon substrate from the capacitance of the CMOS circuit, or left the disk. By wise arrangement of a pressure sensor, it can ask for the pressure for centrifugal separation in the arbitrary positions on a disk. With the pattern of direction of the channel on micro channel diameter information and a disk, pressure data can be used in order to calculate the flow in a certain specific revolving speed. And this information can be used by a microprocessor, in order to control movement of the fluid on a disk and to adjust disk rotational speed.
A surface acoustic wave (SAW) device is also provided as a component of the microsystem platform of this invention. In order to detect a headspace gas, these devices are arranged on a

disk or can be incorporated in the fluid channel on a meter. When arranged in a hydraulic system, SAW is used in order to detect change of the density in the changing buffer, a reagent, or the solution in which a reagin presentation is shown (Anal.Chem. Ballantine et al., 1989, and volume [61st] : 1989 pages reference).

The volatile gas which is on a disk or is confined in the headspace surrounding a disk can be monitored by two or more methods. For example, the Clark electrode which contacts one of the solutions of the gas on a disk, and is arranged can be used in order to detect an oxygen content (Anal.Chem. Collison et al., 1990, volume [62nd] : 1990 pages).

d. Radioactive detection component The microsystem platform of this invention can also incorporate a radiation detector. The analyte on the disk of this invention or the radioactive disintegration of a synthetic product is detectable using the similar single channel photo-diode detector provided with the CCD chip or the function which unifies a signal temporally. Instead, radioactivity can also be directly searched for by contacting the radioactive analyte and arranging a solid-state detector (Lamture et al., 1994, Nucleic Acids Res.).

Refer to volume [22nd] : the 2121 - 2125 pages.

Modular type structure The analyzing system provided as a component of the platform of this invention, Typically, it consists of a controller, a detector, a buffer and a reagent reservoir, a chamber, a micro channel, a micro valve, a warmer, a filter, a mixer, a sensor, and other components. The component which constitutes an analyzing system from on a disk can consist of one or more of the following inside. It is manufactured as the perfect integrated system thoroughly manufactured on a disk, and one component, In a disk, or the perfect integrated system assembled on a disk, It is manufactured as one component and in a disk Or the subset of the component tied up with the subset and interface of the component assembled on a disk, The component connected with an external disk and an interface through the disk which synchronizes and carries out spin, and the component connected with the disk which carries out spin from the position which is still the state where it was stood still about the disk, and an interface (for example, rotary spindle).

A method and the purpose of use This invention provides the countless application and example which are considered for the pliability. However, a fixed function becomes common to most examples. Introduction of the examination of the validity in the time of sample recovery, spreading on the disk of a sample, and sample spreading to these functions, The special assay, the data collection, processing, and analysis which are performed on a disk and across which it goes variably, It is in the section of a disk to the memory of data, or transmission to the remote station which uses communicating software, memory and the output (printing and a screen display are included) to the user of data, and (sterilization of a disk is also included if necessary) sample disk treatment are included.

A sample or analyte are collected using the suitable means for a specific sample. For example,

blood is collected within a vacuous pipe in the environment of a hospital or a laboratory using the lancet for using it by the home or consumers. Urine is collected in a sterile container and can be applied to a disk using the conventional fluid transfer art. As for saliva, it is preferred to dilute with a little distilled water, a quiet detergent, and the solution of sugar seasoning, and to be applied to a disk. This solution can be provided as the mouth rinse/a gargle for detecting an antigen, living thing bodily secretion, and a microorganism. In order to promote the sialorrhea, it is bit by the user, and it is removed from a mouth after that, saliva is collected, and the small bag made from the fishing net polymeric material into which the pharmaceutical preparation of a detergent and the resin which can be digested went instead can be applied like before. Amniotic liquid and cerebrospinal fluid are collected using the medical technique generally inevitably admitted by the staff with qualification.

An environmental sample and industrial samples are collected from groundwater or a factory effluent in the container made in order to avoid the extraction contamination in a sample. Soil samples are collected and are mixed with the solvent designed dissolve the important analyte. The use of industrial use, such as a pyrogen examination, is attained using the sample port designed specially.

It is loaded with a sample or the analyte by the user on a disk. A sample is put on a disk in the position near the rotational center, and central force of a peak is enabled to start a sample by it, In order to provide the wide range course on the surface of [whole] a disk and to interact with a sample, it is optimal to make the number of usable fluid processing components, length, or arrangement into the maximum. Two or more gun chargers can be used and two or more samples can be applied to a disk so that it may be illustrated by drawing 13 C from drawing 13 A. In this example of two or more gun chargers, two or more pipette pipes are arranged at equal intervals, and are arranged radiately. An interval is set and a pipette is arranged so that it may provide that the tip of a pipette fits into the access port on the surface of a disk. A tip has a case of the simple pin which holds a characteristic quantity of a sample with the combination of a surface characteristic and a fluid characteristic. Instead, tips are a capillary tube and a conventional hollow pipe like a plastic cone tip, and a fluid can be manually operated in response to a positive pressure or negative pressure like [in the case of using a manual or automatic pipette device]. A gun charger is manual or can be operated with a robot system. A pipe also enables a tip to align by flexible arrangement and to process a radiate array for a linear array with another composition by a certain composition. In each example, a gun charger contains an alignment device, in order to guarantee refreshable arrangement at the tip of charge on the disk of this invention.

Especially a gun charger is designed for the substances under investigation. Example (in addition to blood, sweat, saliva, urine and a tear, an organization sample, and excrement, a sample), The medical purpose of use containing the body fluid containing blood, amniotic

liquid, cerebrospinal fluid, the pleural fluid, liquor pericardii, peritoneal fluid, sperm, and synovia, and an environmental substance and an industrial (atmospheric gas, water and solution, industrialization study substance, and soil are included) substance are included. A gun charger has a standard blood processor and compatibility, such as intersegmental membrane and a suiting vacuum tube, and approaches the sample in it by penetrating intersegmental membrane. A means like lancet for a gun charger to obtain a focus recovery system and a small amount of blood samples is compatible. A disk is provided also with the seal made of integral-type lancet and rubber in order to extract blood directly.

Not only static charge of a disk but dynamic charge is imagined to be in the scope of this invention (Burtis et al., 1974 reference [C 1 inchChem. 20th volume:932 -94 pages]).

In this invention, in order to attain movement, the combination of the minute manual operating device for operating a microsystem platform and this platform as mentioned above is included. Therefore, arrangement of a component can be chosen so that it may be arranged by a disk and device top or its both.

A mechanical device, an electronic device, an optico-electronic device, a magnetic device, a magneto-optics device, and the other device may possess in a disk and on a disk surface. Some one disk units were explained to the above in detail. A disk may possess the device for communication with the electronic circuit containing the microprocessor for adjustment of a disk function and a disk manual operating device, or other devices. a disk -- the component (the electric power supply for electrochemical systems.) of a detector, sensors, or these devices The energy source for verifiers with various sources of electromagnetic radiation for spectroscope systems, etc., Or a substance like the optically transparent substance which promotes the data generation which uses such operation of such a detector and a sensor, and a detector and a sensor, . Mechanical [for controlling movement of the fluid on the disk containing a valve, a channel, and other fluid compartments] the actuator and the electromagnetism means (the laser.) of providing an electric and electromagnetic device A communication apparatus and a data processing device which arbitrate communication between a disk, and a player/reader using infrared rays, a radio frequency, microwave, an electric means, or other means, It is optimal to include the circuit designed in order to control the procedure and process on a disk of including analysis of a system diagnosis, an assay protocol, and assay data. ASIC or ROM by which these are programmed only at the time of manufacture, It is provided by the user in the form of a programmable similar array with EPROM of FPGA, a flash memory (UV eliminable EPROM), a programmable IC array, a minute manual operating device, or other devices. Corresponding RAM which operates with programmable assembler language and high-level language by CPU, a microprocessor device, and disk communication to the component of this invention, And the component for arbitrating communication with other devices including a facsimile/modem communication with

a remote display or a data analysis system is also provided.
An OFF disk unit contains the other device which accesses information on the micro platform minute manual operating device itself and a disk, and writes in information, or can put a process into operation. Drawing 15 explains the category of the device and subdevice which are some minute manual operating devices, and shows how a component interacts there. Since an "interaction" means exchange of the "data" between a disk and a device or between the components of the device itself in this specification, it is used. The relation between these components is explained below and the detailed example of a component follows.
A drive with these mechanical, a rotational monitor, and the circuit for control and system control on the whole, The external detector and actuator for use with a data reader/write in device, and a disk, The means for communicating to the assay processor for processing exclusive data, the coded data, and assay data, a central processing unit, a user interface and a disk, a user, and other devices is included.
A mechanical drive and a corresponding circuit possess the device for choosing and attaching two or more disks from the device for controlling the revolving speed and the angular position of a disk correctly, and monitoring them and a cassette, a turntable, or other two or more disk stores. The system controller was programmed a priori or provides the device control on the whole in the state where a user interface can be accessed. Disk data reading / write in device is provided in order to read the coded information in a disk or other media. The writing function to a disk possesses and the arbitrary sections of a disk enable it to memorize the analytical data generated from the assay performed on the disk the optimal. This option does not have an advantageous disk in the purpose of using the disk currently polluted with the absent (it is (like sterilization)) means for neutralizing biological danger or other danger, and danger. A device not only in the component of the detector and sensor which operate in cooperation with the component of others on a disk containing an external detector, a sensor or an analysis apparatus, and diagnostic equipment, A micro valve may be operated and the external actuator containing the optical magneto-optics component, the magnetic component, and electrical component for putting a process into operation on a disk may also be provided. These field of a disk minute manual operating device of a certain kind is explained to drawing 14 F from drawing 14 A.
The disk data processor which makes processing and operation of the coded disk data usable is also incorporated advantageous in the device of this invention. These components include minute manual operating device CPU, programmable circuits (FPGA, PLA, etc.), and (it is (like ASIC)) the software used by the exclusive chip set. It performs on the data produced from an event, and a disk, and the assay processor for processing the assay which is detected by the external detector or communicates from an one disk configuration element is also provided.As for a device, it is advantageous that the computer which enables processing of a central

processing unit or disk data and assay result data analysis (prior programming) is also included. The conventional computer functions (a word processor, graphic creation, etc.) can also be provided.
A keypad, an optical pen, a monitor, an indicator, a flat-panel display, A user interface including the interface to the host device or peripheral equipment by a communication option and a printer, a plotter, and a graphical device are provided as a component of the micro platform minute manual operating device of this invention. The interface by connection with standard (it is (like RS-232 and IEE-488M SCSI bus)) communication and electrical communication, It is provided via the internal modem or external modem for short-distance or long-distance telecommunication ("cellular" telecommunication radio frequency) and hand control, or the automated telecommunication.
Disk information contains both assay data created during use of the software written in the disk for promoting operation of the microsystem assay built on it, and the microsystem by a user. Daystar information includes the data (the present status of a valve etc. which can be accessed through the reflection property of the covering material which lets a magnetic pickup pass or is in a valve position) written in a disk (it is (like the data coded optically)), and information peculiar to a disk. Although the information written in a disk may include the information on a sound / videos (a binary, binhex, assembler language, etc.) / examination, and machinery form, it is not restricted to the information on a sound / video / examination, and machinery form. The system control data used for start up of the control program for this data carrying out the spin of the disk, or performing assay, Information, analysis result data, and background information are included at the time of the information about a disk configuration, a disk identity, use, an analytical protocol and programming, protocol description, a diagnostic program and a test result, and use. The acquired data information can be memorized as an analog or digital, and may serve as combination of unprocessed data, processed data, or both.

System control data contains the synchronous data for enabling it to function a microscopic device by right angular velocity (there are two or more things) and acceleration, and the data related to the physical parameter of a disk. A disk configuration and compatibility data contain the data (composition of an one disk unit, a valve and a reagent chamber, a reaction chamber, and a detection chamber) about the type of the disk used in order to judge the applicability of the test protocol of hope. This data provides the identity on the type of a disk, and the function of the function of a disk. It may form some interactive feedback system for checking a microsystem platform component before start up of assay with a disk again. Disk discernment and a sequence number enable the manufacturing date and disk type with which it is coded and provided on each disk, and those data is coded by the manufacture maker, use, and exact discernment of the disk by User Information written in a disk by the user. The history of the

procedure performed by the user by a disk is also included in disk data. Not only the information written in disk data by the user but it is machine recognition (it is got blocked, and while what number of assays and which assays has been intact) typically. Or the history of the procedure performed by a disk written in since it is in a preparation-completion normal state for use is also included.

Drawing 30-32 displays operation of the software coded on the disk used in order to control the device which drives a disk. Drawing 30 displays a process flow. The control program coded as data on a disk, (A compact disc or a "laser vision" disk) It is read by the conventional means, such as laser of an optical memory measure, and since it loads to the random access memory (RAM) of a minute manual operating device, it is decrypted by the conventional method. And this program is executed. At some applications, execution of a program to completion is automatic and there is no active dialog with a user. In the other application, a user is shown the option across which it goes variably (considering it as a menu typically) for executing a program. For example, user choices, such as whether to determine the method of reporting whether diagnosis, a testing procedure, analysis, or the comprehensive set of other functions set or restricted being performed, a detailed grade, or a test result, are provided through a user interface.

Drawing 31 and drawing 32 show one special set of a step with which it was programmed for performing assay using said capillary tube micro valve. The other arrangement of the step within a program is clear to the usual engineer, for example, it will be easily unified, in order to send the signal for starting the actuator of a micro valve and others. The program indicated here consists of the block set up in order that different revolving speed may change the quantity of the time which foresaw valve regulation of a capillary tube, mixing, and an incubation. (for example) It is not illustrated although the mixed program block which performs a spindle motor through oscillation acceleration and a slowdown is possible. These program blocks consist of producing the standard of the status of outputting a command to various electronic devices (a motor, a detector, etc.) and reading data in a device, a device, and a process. (A motor cannot reach a suitable speed the door to a device is not closed electric power is not detected with the light source for spectrometer measurement) When status is a "defect", the device for stopping a program is shown in the program. This state will lead to a program stop (as [illustrate]), or a program will be further returned to a user via an interface in quest of directions.

The program shown here also incorporates a data acquisition block, a data analysis block, and a data output block further. in order that a specific acquisition process here may control acquisition of data by a gate -- the coded signal on a disk -- The lightwave signal connected with --, for example, the detection chamber which passes a detector, -- use is needed. Thus, data is acquired a sake [at the time of / special / the detection chamber being close to a

detector]. In order to judge which portion of data is effective in analysis, extracting data continuously -- the feature in the data -- for example, -- otherwise, the shape of the signal as a function of time to be visible like the square wave for the array of the window on an opaque disk -- it is also possible to use --. Data analysis may include not only the other method but a minimum of 4 nonlinear square-shaped conformity, line revolution of the data as a function of time, or corner point analysis (data in the corner point time for a reaction). Data output may take "yes / form of a no" reply over a user interface, digital data and a built-in storage, or an external storage.

No component parts of this program need to possess on a disk. For example, a program resides in a computer permanently, and in order to obtain a revolving speed profile required to use a disk, it can be designed read the disk itself. Other fields of all the of how and when data is read and analyzed and a program can be made into the part of an exclusive program, or can be read in other media.

Analysis / test protocol data is description of an examination and analysis which can be performed by a disk. These data may include a detailed description of data analysis and processing containing the purpose of use, test protocol, and data analysis protocol of a disk, if it may become simple like the title specified on a disk. The analysis / test protocol programming which can be supplied to a programmable logic circuit so that it can be used as a subroutine specified as the system in a still more common software mechanism or a device can perform analysis of hope are provided. The phonetic description of the analysis process performed on a disk, video description, text description, or the analysis / protocol description like other description including the conditions for background information and the effective purpose of use, preventive measures, and other fields is provided.

Encryption, and identity data/programming are provided in order to guarantee the security of the data generated by the analysis programmed and performed by a disk.

Encryption/decipherment routine is used in order to restrict access to the data memorized on a disk. Such a routine is used also for a medical-diagnosis use.

A system self-diagnosis is also provided. A system diagnosis contains the status of the test result about the detector function written in a disk by the separate device which is memorized by the disk memory or is used at the time of diagnosis, a reagent chamber, a valve, a heater element, and other components.

At the time of use, information is a form of video, a sound, or a text picture which contains a position, time, a staff, etc., for example, and it is at the time of the use (sample charge etc.), and it is coded on a disk. At the time of use, when these procedures are performed by information, the test result data recorded by the disk itself, or a disk player/reader is also contained in it.

For a disk, a certain kind of data is peculiar, and can be accessed through a minute manual

operating device. These can be accessed through an external detector and a sensor including the sample validity test data which records existence of the sample in a suitable reservoir and the fluid processing field of others of a disk or a reagent, or an absence. The status of a valve including record of change of the valve status between the procedures performed within a disk is also recorded. Valve status is judged by, for example, using the magnetic pickup in the device attached to a magnetic valve system. Status can also be made visible through the optical window on a disk. As for the activation study contaminant or the biological contaminant on the outside surface of a disk, it is optimal to produce the warning message which can record at the time of detection by the sensor containing a device, and is sent to a user interface like a display or print-out.

Disk data and information are memorized using the medium containing both device itself which uses the recording medium (the disk which is got blocked and read optically, most preferably reflection property of read-and-write CD-ROM) and electronic constituent of disk material across which it goes variably. Information is coded using the Prior art used for computer information memory, or the improved art. Video information, speech information, and text information are digitized using the method developed by the digital video industry, the audio industry, and computer business. . [whether an analog signal like the signal observed within a photo-diode detector or a photo-multiplier produced from a testing procedure is changed through an analog-to-digital conversion management form, and] Or it may be supplied in unsettled form or amplification form through the external jack for processing an off-disk or an OFF device. Various examples of the disk manual operating device of this invention contain the capacity for [for both the read in to a disk and writing of data] using read-only data from these arbitrary medium types. A decryption code and an authorization code can use it aimed at obtaining security. Voice CD, the art which is adapted from CD-ROM, "laser disc" art, and a bar code are used for a disk store medium, and it possesses the optical medium which utilizes the flat-surface part to reflect, and of which /reflection is not done and hollow on the surface. A magneto-optics medium and magnetic media are also in the scope of this field of this invention that uses the conventional magnetic storage medium. The electronic data memory measure which uses the status of the internal array of the electronic constituent for information processing (FPGA, PLA, EPROM, ROM, ASIC, IC network) is also provided. A chemicals recording device including simple dyeing of the chamber of a detector section or a device is also indicated in order to provide simple visual record of a test result. Even if this simple chemicals recording device does not need an expensive precise device in a function further rather than needed in order to only judge existence of a chemical marker or the assay which is based absent and can be analyzed, it serves as the achievement method to diagnosis at a house.

Software and communication The software which provides the information and instruction set

for microsystem performance, a quality control, data acquisition, handling, processing, and communication is included in the scope of this invention. For the purpose of this invention, such software is called "a machine language command." It is advantageous that control and analysis software are provided with a high-level language like C/C++, Visual Basic, FORTRAN, or Pascal. A driver is provided for the interface board which changes a command into a minute operation unit command on the bus of a host computer (one of whether it is built in the device, or it is built in the host computer tied up with a device and an interface). A driver for experiment control software like LaabView can create again using the conventional industry standard interface protocol. As for such applications, it is most preferred to have a function performed by many general computer platforms, such as UNIX/Linu, X-windows, Macintosh, and SGI. Control and analysis can be performed even if it uses an exclusive chip set, a circuit, and ROM and EPROM. For example, all the programming can guarantee examination validity using the testing procedure of the ROM base performed without the possibility of destruction of an end user at the time of manufacture (on partial target [At least]). For separate application software, the data from a disk player on a non-controller platform, (Excel, Clarisworks, SigmaPlot, Oracle, Sybase, etc.) It can also develop so that it can analyze using usable application.

Some uses of the disk art indicated in this specification, Since the important question about human being's health is included, the disk diagnostic software must be able to analyze diagnosis of a disk, its contents (a sample, a reagent, a device), a player, and analysis software, in order to guarantee the validity of a result. In the type of the information used by this diagnostic software. Verification of sample validity, a flow and a disk format, and software / testing procedure compatibility, An one disk software test and an off-disk software test, (It is for example, like channel allocation and alignment) The quality control monitor of disk manufacture, Diagnosis of the workability of an one disk sensor, a detector, and an off-disk sensor and a detector, positioning and functionality, player communication, a microprocessor, a microprocessor / CPU, electric power stability, etc. is included.

Diagnosis of a machine configuration element and an electronic constituent is performed by the method whose full knowledge those who became skillful in art have. In order to detect incompatibility with the component of others of system hardware or the system software from either a minute manual operating device or a disk, a software self-test, It is attained using the check list/verification of a software routine and a subroutine.

The disk diagnosis related to a sample includes quality for assay of a flow, sample validity and reagent validity, type, and assay to be performed. The disk diagnosis related to a device includes the check, the electronic constituent self test, valve regulation, and a thermal control examination of a detector/sensor function. Software diagnosis provides the self test, the breakage safeguard, read-only examination, and read-and-write examination of the software

configuration element coded within a disk or a device. A disk format is also checked using disk diagnosis, a disk format and an assay type are read appropriately, and it guarantees that it is in agreement with the protocol held in an equipment memory.
One disk software contains CD-ROM for read-only software usable as a ROM especially diagnosis, assay control, and data analysis. Read-only software cannot be changed, is suitable for a disk and is designed for the special procedure and the process of guaranteeing the fail safe mechanism over breakage by a use user. Software is also realizable within a coding medium, or (it is (like a bar code)) a spare medium (optics, magnetism, etc.). (It is like FPGA, PLA, EPROM, or IC array) The reprogramming of the re-programmable software can be carried out with a disk minute manual operating device or the device designed by this purpose. The software of a similar type is instead provided with an one device. In one of cases, the keyboard of a device, a touchpad, a display component, or the user interface through the all possesses.
Application software is provided in read-only software form or re-programmable software form. The software which can be read in a standard computer data storage medium is contained in this component of the fluid minute operation equipment of this invention.
an example -- a disk or an equipment memory -- there is nothing -- or it memorizes -- the workstation connected by network or access on-line service like a newsletter and news service. And the medical application depending on the accumulation database which can be accessed from creation of pictures, such as pattern recognition and statistical-analyses software, and the software for analysis, or the diagnostic program for analysis is included.
One of the adaptation of use of the peculiar operating system developed by the disk and the object for minute operation units of this invention or the existing OS can perform integration of control and application software. The optimal, in order to combine with the "point and click" system which is easy to use a text, graphics, video, and a sound, authoring software is used for OS. It not only provides OS for development of auxiliary software by the disk reader / player manufacture maker, or the independent software development person, but, In order to customize programming by the refined user, object-oriented environment or its facsimile (for example, system of a LabView base) can also be provided.
OS can be chosen also in order to enable the design of assay of a disk and a disk base. The mechanical design containing the simulation of rotational motion power and stability and a flow simulation are contained in favor of a disk design software package.
The communication plane of this invention includes the example of the hardware about remote control, the data input to an analysis site, and an output, and software from a user. The interface according [the communication function by connection] to a local bus (it is (for example, like the VGA bus for video signals)), and (it is (like RS-232, IEEE-488, and a SCSI bus)) the conventional connection, High-speed-data transmission, communication and video

transmission, communication, or the picture transmission and communication through an Ethernet connection, k, Appl et al., and various local networks (LAN) are included. A telecommunication device possesses the cellular transceiver for short distance communication, the radio frequency for long distance communications and a microwave transceiver and hand control, the internal modem for automation telephonic communications, or an external modem. The input jack and the optics, and the infrared transmission port of an analog signal for an input from video yne / outport, the analog out circuit for data communications, and other meters are also provided for communication with a circumference meter.

Composition of the minute manual operating device for a certain kind of application use A microscopic device includes various combination of the above hardwares and software. Drawing 15 is the illustration of a general combination of communication within a device, a device, detection, and control instrumentation. A certain kind of use may not be provided with a function of a certain kind, for example, the portable instrument may not be provided with the graphic user interface. or [that a minute manual operating device is a "stand-alone" device] -- or -- for example, They may be a host for circumference elements like a computer, a printer and the circumference meter to a still more large-sized set of the device containing an image processing device or a control pad, and data input (it is (like a Newton type device or an equivalent thing))/readout system, or an integrated type system. The device in all the examples contains the system for monitoring the hardware for rotating with both the fixed speed and variable speeds, and revolving speed. A device puts diagnosis of a sample and a disk into operation, and "external" examination and detection are performed so that it may be described by this specification, Put diagnosis of a sample and a disk into operation, and "external" examination and detection are performed so that it may be described by this specification, Analysis may be put into operation on a disk through a special actuator like a valve, information peculiar to a disk, the information coded within a disk, or other data / information-storage-medium information may be read, and the device for writing information in a disk may also be provided for some uses.

The auxiliary element in a device including the array of system control, a data processor, and an assay processor, an external detector, an external actuator, assay out and a data out circuit, communication, and software is special to a device, or is peculiarity or its both at a use. For example, in "time of use" carrying, or home usage, starting of the program of a player continues after charge of a sample. System control is provided by the front panel control and the indicator which can access various programs memorized in a disk or a device. These programs "depended on connection" use a controller circuit for the both in order to read operation to a disk, the disk from a memory, or a memory, in order to carry out the read and write of the operation, or in order to perform an examination using an external device. A device

is a priori programmable, in order to perform two or more examples of the same procedure that can design for the performance of an independent procedure or uses the set or separate disk of a procedure. This type of these processors (there may be plurality) and data processors (it may be plural) of a device are designed process analytical data (assay processor) and the coded data (data processor). Since it outputs to a user on the front panel or a video display, the information from these processors becomes usable, and in order to guarantee the right operating condition for assay, it can also be used inside. The result of a system-diagnosis examination for this inside information processing to guarantee a desk identity and test type compatibility, The result of existence of the contamination detected before existence of a detector port scanning reagent, the reagent judged by the optical absorption which passes along the reservoir of a sample, and a sample, and an examination begin, and the self-test in an external detector and an actuator may be included. These results are used by a system controller, in order to judge whether the demanded examination can be performed.
After loading and starting, an analysis result is memorized inside within an electronic memory, or can be coded on a disk. And the result of these analysis and procedures is sent to front panel displays (flat panel LCD etc.) using a suitable video driver. The processed assay data can also be sent to 1 of RS-232, RS-232C, and many standard digital I/O systems containing IEEE-488, and the system of others which were well versed from digital I/O and an interface. Similarly, the coded disk data can be sent to a sound / vision display. An unsettled analog signal can also be changed to one or more external jacks for OFF device memory or processing.
But technically the example of the device which is not precise, It is a portable system which is not larger than the portable audio CD player consisting of the disk drive, controller, and selector for the angle acceleration / deceleration profiles programmed by the programmability for a limited number of procedures, or beforehand. Such a device is advantageous to the toxic chemicals/stain testing in the spot. The analyte of a test objective is introduced into the disk inserted in a player, and a suitable program is chosen. Since an analysis result is read by still more large-sized player/reader later, they are whether it memorizes on a disk or it is immediately displayed on a user, and its both.
A result can be memorized also as a peculiar state (for example, positive / negative status of the litmus paper within various cuvette) of an indicator, and other data collection or analysis is not performed by a device. This data will be accessed by still more large-sized player / reader, or the means of others besides field work environment. The information about the position of specimen collection, time, and other conditions is inputted through a user interface.
Another example is the stand-alone type device provided with an active communication function and still higher pliability. The illustration use for such devices is a home blood assay device. Only by only pushing one independent button preferably, this device trickles blood on a

disk, inserts a disk, and is used by the individual who puts assay into operation. And one or more analytic procedures are performed. Assay data is transmitted to the software which is an one disk or performs indispensable analysis in either in a device. A device is attached to a home telephone circuit everlastingly or temporarily, and automatically unprocessed data or the reduced data, As compared with the data of the past from the standard or the same patient to whom it transmitted to the computer in the middle position, and data was generally admitted used in order to analyze the transmitted data, or its both, as some a patient's devices, lasting record -- data -- probably -- data analysis and advice -- or it is considered as the check of the receipt of the continuation treatment proposed / recommended (an internist is contacted).
The desktop circumference / host application station is one of the data protocols with which many are considered, receives the command from a host computer and comprises an above device provided with the capability to answer a host computer. The system can transmit data to the device and workstation which were provided with the function to achieve a host's role or by which peripheral equipment and others were connected by network. The remote-access function of the function programmed a priori, the reprogramming function of a function, and the Real Time Control function are also provided.
it had the corresponding software of this use which is further arranged as a nurse's station in a hospital as for another example -- were centralized or they are clinical player/reader. If an examination is performed on a disk, information will be relayed to an internist by the pager through a telephone, a facsimile, or a short distance transceiver. A patient's identity can input a bar code by using the light pen attached to the device at the time of sample recovery, and the dominance point of positive patient / sample discernment is provided.
A device provided also with an interface with the unified type computer which is provided with said function and functionality and is further provided also with a high resolution graphic function, an image processing function, and the other function can also be provided. Although a computer gives control of the device for performing said function to circumference systems, actual integration accelerates a data transmission rate substantially. In an integrated type system, wide range analysis software, and a background database and information possess. The disk memory cassette of an anchor ring slide tray is also an advantageous function of such a system. This kind of integrated type system is effective in large-sized analytical laboratory environment.
The system of a standalone version is effective in the use in the isolated environment. An example is used in remote environment like test equipment or the environment which is not generous of the air used from the environmental purpose in the Arctic Circle, water, and soil, or contains the device for using it on the battlefield of toxic-chemicals detection.
The microsystem platform provided by this invention, It is effective also in order to prepare a sample for other analysis meters like a mass spectrometer, a gas chromatograph, a high

pressure liquid chromatograph, a liquid chromatograph, capillary tube electrophoresis, inductively-coupled-plasma spectroscopy, and an X-ray absorption precision structure. In some uses, since a final product is analyzed, it is removed from a disk.
By incorporating water 2 phase-separation system, on a device, a sample is condensed in advance and can be purified. This can be attained by mixing two phases mutually separated based on a thermodynamic difference like a polyethylene glycol (PEG) and dextran, for example. Instead, an environmental test like colorimetric analysis can improve by adopting cloud point separation, in order to condense and raise an optical signal. Small scale back run chromatography can also be performed on a device (the 63rd volume :P. AGE Foucault, 1991, a chemical analysis, reference). In order that the central force on a disk may oppose mutually compulsorily and may make it flow through the fluid of different density, it can be used, and it brings a result which a component divides into the density inclination for creating chromatogram by ****.
A use and the purpose of use In the microsystem platform and minute manual operating device which constitute the fluid engineering microscopic apparatus apparatus of this invention. There are a minute composition use and a microanalysis use, and a fluid is moved on a platform by the central force produced at the time of platform rotation. [variably / for the pliability of a design] The short typical example of the type of a use is mentioned later.
It is not comprehensive, either, and becoming restrictive at all the examples of this invention does not have intention, and it is in the scope of this invention.

This invention is used in favor of research, especially the microanalysis in a biology research use. An amplification-living body outside routine including immunoassay, polymerase chain reaction, a polymerase chain reaction, and a magnetic chain reaction is contained in such a microanalysis. Molecular assay and microbiology assay including restriction enzyme digestion of DNA, and DNA fragment size separation / judgment can also be attained using the microsystem disk of this invention. Minute composition operation like DNA fragment ligation, substitution composition, radiolabeling, and fluorescent-labeling-izing and antigenic labeling can also be attained using the disk of this invention. Nucleic acid sequencing which uses the synthetic protocol which uses enzyme substitution composition of DNA, and across which it goes variably can be performed, The decomposition and analysis of a set of an independent twist DNA fragment which are produced as a result and which were nest-ized, It can be distinguished and specified on a disk, the resident software corrected by such software that can be used for microscope automation DNA sequencing machinery now can be used, and it can arrange in one arrangement. The chromatography which contains pH measurement, filtration and an ultrafiltration, affinity chromatography, and reversed phase chromatography in the other use, A microorganism use, flow blood count and immunoassay including

electrophoresis, and the micro culture of a pathogen and discernment, and the old conventional laboratory procedure of others which are performed on a scale of a microscope are included.

The example of explanation is immunoassay. In order to detect at present research, and the antigen/antibody interaction currently used by clinical, the methodology on two or more experiments exists, but the strongest immunoassay protocol needs assay of a "sandwiches" type. It is shown [whether there is any antigenic analyte with an antibody special to the antibody made into immobilization made into immobilization, and] to the sample of a test objective in such assay. After that, it is combined and a second antibody special to the epitope from which the same antigen differs forms the "sandwiches" of an antigen between two combined antibodies. A second antibody is connected with the portion in which detection like radiolabeling or fluorescent labeling is possible or enzyme functionality, or catalyst function nature in such assay. For example, in order that the intensity may produce the color change within a substrate related to the quantity of the second antibody combined within sandwiches, horseradish peroxidase or alkaline phospha TASE is used.

The example of the disk which is adapted in order to perform such immunoassay is shown in drawing 17 Q. A second antibody is connected with alkaline phosphatase (AP) in this example. Existence of AP activity and quantity are judged by monitoring the colorimetry conversion by one enzyme in the illustration board shown below. That is, B-naphthyl phosphate is changed into insoluble azo dye when diazonium salt exists.

5-bromo-4-chloro-3-indolyl phosphate is changed into 5,5'-dibromo-4,4'-dichloroindigo when copper sulfate exists. Or 4-methylumbelliferyl phosphate is changed into 4-methylumbelliferone which emits light at 450 nm.

In one illustration example, a reaction chamber contains an antibody with an antibody special to the antigen made immobilization by adsorption to the reaction chamber of an antibody. A reaction chamber is adjoined and the reagent reservoir containing a second antibody is arranged advantageously.

This antibody is connected with an enzyme like alkali phosphate.

It is loaded with the sample which may contain the important antigen clearly recognized by said antibody in an inlet port. In order that a disk may introduce a sample in the reaction chamber containing the antibody made into immobilization first, spin is carried out, and after sufficient time to be saturated to the grade to which an antigen carries out the raw material of the antibody which is after that and was made into immobilization into a sample passes, the introduction to the reaction chamber of a second antibody continues. Instead, a sample is contacted with a second antibody, and after it is allowed to interact, it is introduced in a reaction chamber. The incubation by the antibody of a sample is performed without making it rotate for about 1 minute. After each incubation, in a reaction chamber, the washing buffer

from a buffer reservoir carries out spin, and it is put into it in order to remove the antibody which is not combined. In alkaline phosphatase assay, o-dianisidine of underwater 2 mg/mL, The solution of B-naphthyl phosphate of 1 mg/mL in the boric acid / 50mM KCl (pH 9.2) buffer of 50mM and the magnesium chloride of 100mM is sent to a reaction chamber in a suitable quantity. The range of second antibody combination by which enzyme connection was carried out is estimated by detection of the purple precipitate which uses a photo-diode or a CCD camera.

The disk constituted for an immunoassay use is shown in drawing 17 R for explanation.

In the alternative example of immunological assay of this invention, this invention specifies the type of the cell of specific existence of a cell and number or a fluid, and most desirable blood, urine, amniotic liquid, sperm and biological fluid like milk, and provides the means for measuring quantity. In these examples of this invention, a microsystem platform includes the uniform field on the chamber or disk adjusted in order to combine a specific cell or cell types selectively. the ratio after adhering a cell to the surface -- the component of a special joint cell and others is removed by a fluid flow (washing), or (the inertia flow of a fluid is included in response to the centripetal acceleration of a disk) central force. The important cell to which the micro platform surface or a chamber adheres is detected, Although a microscopic means and spectroscopy means, a fluorescence means, a chemical luminescence means, or a light dispersion means is included, it is quantified using a microscopic means and spectroscopy means, a fluorescence means, a chemical luminescence means, or the means that is not restricted to a light dispersion means. This invention is provided for a toxic monitor like the metabolic turnover monitor for judging the effect of the therapy of the drugs which influence a living body in such a cell to which the special surface adhered, or others. The array with which such the surface was compared is provided in the example of a certain kind for a cell blood count use and a blood count use in order to promote perfect judgment of the purity and the degree of asepsis of a certain kind of biological sample.

The surface or the chamber of a disk for special combination of a specific cell or important cell types is adjusted in order to provide the special binding site for it. Typically, the antibody is special to an antibody and the cell surface antibody which the surface or a chamber adheres to a monoclonal antibody preferably, and is expressed with a cell or important cell types. Ligand special to the cell surface acceptor instead expressed with a specific cell or important cell types is used in order to provide a specific adhesion site. The example of a disk of a certain kind is provided especially with the array of the adjusted surface or a chamber. The surface and a chamber are provided by contacting the surface in the solution of a suitable antibody, for example. In practice of these adjustment methods, contact with surface un-special interception protein like a bovine-serum-albumin non-particular continues after contact with a surface antibody. An antibody and interception protein can be contacted to the surface or a chamber

using the point head which can be used advantageous because of this purpose and which is driven in piezo-electricity (as [use / for an ink jet printing use]). Instead, it can also use spraying an antibody solution on a chamber or the surface using screen-stencil, i.e., an airbrush. These methods are liked when adjusting the surface and a chamber on a scale of 0.1-10mm. In an auxiliary alternative plan, microlithographic technique and microstamping technique can use it for adjustment of the surface or a chamber.
By practice of this invention, the sample of the biological fluid containing a specific cell or important cell types, or other fluids, It is applied to the adjusted surface or chamber, and during such sufficient time, the adjusted surface or chamber is contacted and it is allowed that special combination to a cell or the surface of cell types is enabled. Since the contact with the surface is prevented by the cell sedimentation characteristic of a lot of fluids, the chamber and the surface where the height of the transverse direction in a microsystem platform was stopped by the minimum are liked.
By washing the surface or a chamber with sufficient fluid amount to remove such un-special combination, non-idioblast combination is suppressed to the minimum, or is eliminated from a chamber or the surface. Washing is attained by the simple bulk flow of the fluid on the surface or a chamber.
After washing, the cell adhering to the surface or a chamber is detected, and counts. In a desirable example, detection and a count are attained using fluorescence microscopy. In practice of this invention, in order to provide with a fluorescence signal all the valid cells in which the disk remains, special coloring matter can be used. Film osmosis coloring matter like acetoxymethyl ester coloring matter can be used for coloring matter, for example, and it can add it to the surface or a chamber directly. Instead, a special antibody can be connected with such coloring matter. Coloring matter can be added to the biological fluid which contains a cell before the introduction to up to a microsystem platform, or such coloring matter can contact the cell which is in the place of a basis on a disk.
Existence of a cell is detected using the fluorescence detector containing a light source, a sauce filter, a dichroic filter or a mirror, an emission filter, and a detector like a photo-multiplier.

In an example, thin layer chromatography is independently attained on a micro platform disk including the square cross section channel of 100pm emitted outside from the center of a disk. Since mechanical intensity and stability are provided, each channel is starch, gypsum fibrosum, polyacrylate, and binding material (0.1-10%) like a prototype typically.
It fills up with a ****** separation substrate. (Use of such a compound in the conventional TLC application) It will be explained to a chemical analysis and a 66th volume:27A page in Poole et al. and 1994. Adsorbent is also contained in material including the separation channel which contains cellulose, polyamide, polyethylene powder, an aluminum oxide, diatomaceous earth,

a magnesium silicate, and silica gel, for example. Such a substrate is improvable by a silanizing molecule like a dimethylsilane, ethyl-octa- Silang, and 3-amino profile silane, for example. A separation substrate includes the fiber glass or the PFTE matrix with which adsorbent was impregnated.

It is loaded with a sample via the port arranged by approaching the center of rotation of a disk. If the spin of the disk is carried out, a mobile phase can flow now outside through a separation substrate, and will carry a sample component to the periphery of a disk with characteristic velocity. A mobile phase can be chosen from two or more suitable solvent systems containing hexane, methanol, and dichloromethane. It depends for selection of specific adsorbent on disk material, a separation substrate, and the character of the component of the sample for separation. Selection of the visualization reagent used in order similarly to detect the separated sample component is special to the substance separated. For example, ninhydrin is used in order to detect amino acid. In addition to potassium permanganate, an alimonyl chloride is used for hydrocarbon. In addition to anisaldehyde, sulfuric acid is used for carbohydrate. And bromine is used for an olefin. The separation channel after separation was attained using the CCD camera is imagined. The disk constituted for him layer chromatography applications is shown in drawing 17 R for explanation.

The medical-application way which uses the microsystem of this invention is abundant, and strong. Various examples of this invention provide the household device, the device for clinical, the device for hospitals, and the portable device for high-speed analysis of a blood component, a blood gas, drug concentration, metabolite, and an infection agent. In a home monitor example, it is simple and this invention provides with a FRIENDLY device the consumer who needs for a patient to add the glob of blood, a urinary sample, or the sample of saliva to the specific coating regions on a disk, to insert a disk in a device, to push a button, and to put a device into operation and who is easy to use it. In the environment of a hospital, both the experiment example in the side of a bed and a clinical experiment example are provided, the example in the side of a bed is linked to the central processing unit arranged electronically in a nurse's station, and the example for clinical includes the medical reference library for high-speed automation diagnosis of a patient sample. The medical-application way of this invention A blood test (it is (like the monitor of the count of the blood platelets in the patient treated with the chemotherapy agent)), Metabolite, drugs, and the immunoassay for chemical species of other biological kinds and others, The determination of an ingestion effect monitor, the monitor of the lupus erythematosus, the blood glucose level in a diabetic, or a ketone body level, The monitor of the electrolyte of an automatic cholesterol examination, automatic blood drug concentration determination, toxicology, and the blood component relevant to ** and other medical science in the side of a patient's bed, the monitor of the sepsis/endotoxin, an allergy examination, and a thrombus monitor are included.

An invention provides a **** examination, an industrial use use, and regulation conformity also with an analyzer machine again. Furthermore it is installed as a part of industrial quality control system, not only an extensive example but portable and the example held by hand preferably are provided. The use of these examples of this invention includes the analyte examination used for regulation conformity especially the examination of an industrial effluent and a tail, and the industrial quality control of an most advantageously as special endotoxin determination as a human consumable-goods item, especially drugs. The use for the examination of perfume and other complicated mixtures, mixing, and evaluation is also in the scope of this invention. This invention also provides the chemical reaction and synthetic-model-izing which can examine and evaluate a reagin system or an industrial production system by a reduction simulation. This invention provides the analysis which uses the microsystem platform of this invention, the potential research which can be adjusted to a macroscopic level after optimization, and high prototype-ization of the cost effect of the chemical reactant system of medical application and industrial use.

The use of others across which it goes variably including a minute synthesizing method and the use for courts is provided.

Although the after-mentioned example means describing further the desirable example of this invention of a certain kind, it is not restrictive at all.

Example 1 chemical analysis, composition, and production of the micro platform disk for uses

The micro platform disk of this invention, Especially, for the reason in shaping, grinding, and crushing, it is produced from thermoplastics like Teflon, polyethylene, polypropylene, methyl methacrylate, and polycarbonate. Instead, the disk was able to be made from silica, glass, crystal, or an inert metal. A fluid managerial system is constituted by the continuation use [of such materials installed in thermoplastics with the gradual gestalt / one or it]. It is a schematic diagram of the disk which suited in order that 17E might perform DNA sequencing from drawing 17 A. Injection molding of the disk of this invention is carried out, and it produces in the optically transparent substrate * layer which has an optical pit by the means of the conventional compact disc (CD). This disk is a circular disk made from polycarbonate of 120 mm in diameter, and thickness 100pm. An optical pit provides a means to encode an image and sound characteristic of programming, a user's interface information, application, and driver arrangement which control a device. Arrangement of TORAIBA is influenced [whether a minute manual operating device is a hand head, the bench top, or a floor model and] by the details of external information transfer, and arrangement of other specific hardwares. Then, this layer is put on the reflexibility surface by the suitable window for an external detector, especially an optical detector, and it leaves a transparent thing on a disk. The layer of various others of polycarbonate of thickness is constructed with the gestalt of other structures which include the equipment on the disk for a channel, a reservoir, a reaction chamber, a valve, and

other control constitution elements on a disk. These layers are beforehand cut in geometry suitable for production and the given use, and can be attached with a disk. The layer containing materials other than polycarbonate is also incorporable into a disk. The constituent of the layer on a disk is most and it depends for it on a use specific into the reagent which should be used by a disk, and the chemistry compatibility demanded. An electric layer is incorporable into the disk which needs electronic circuits, such as an electrophoresis use and an electric control valve. It is incorporable into insertion appropriately constructed in a control device like the resister network which can form a valve, an integrated circuit, a laser diode, a photo diode and an alternative heating region, or the deflection logical structure by performing module installation directly on a disk.

It dries, and by spraying on a reservoir using the same means as the head of an ink jet, the reagent which can be saved can be introduced into a suitable open chamber, and can be dried on a disk after that. Then, a top layer, port, or shaft including a port and air extraction is carried. Then, a liquid reagent is ejected to a suitable reservoir and the protective cover layer containing still thinner plastic films is applied.

Other various disk arrangement suits a specific use, and is indicated by 17P from drawing 17 F as it is described by the introductory notes of a figure.

A blood constituent can be measured via hematocrit analysis using the micro platform disk for analysis manufactured as indicated by Example 1 performed within the device which includes the minute channel layer which has many minute channels as shown in example 2 blood constituent measurement drawing 18. A minute channel layer is 100pm thickness.

And in order to avoid the condensation between assays, it is processed by heparin.

The blood sample which should be analyzed is drawn in the channel arranged at right angles to the direction of rotational by capillarity as it is shown in drawing 18. A majority of such channels may be radiately arranged on a disk. If all the samples which should be examined are drawn in a channel, a disk will be rotated at speed of 8,000 to 10,000 rpm, and sedimentation of the red corpuscles within a channel will be made effective. Once suitable time (3 to 5 minutes) centrifugality is performed, the conventional CD laser system will be used with an above-mentioned device, and the blunder trick of each sample will be simultaneously measured by the stroboscope reader of each channel. If laser passes the boundary line of red corpuscles, the change in the scattering pattern of the light detected by a photo diode detection machine, It is changed into the hematocrit value based on optical SUKYATTA / blunder trick information on the standardization set saved in the internal processor and memory of a device. Raw information is tied to instead of via an infrared port or a hard-wired interface at the microprocessor for analysis. the place in the whereabouts [like the nursing station in a hospital] such whose a central microprocessor is and by which CC was carried out -- or it is in a substitute or the medical center connected with the blunder trick measuring

device by a telephone or other presumed conjunctives. A blunder trick applies simply the blood drop made from the spatula on a disk, or [subsequently, / conducting the device of easy specification, and automatic blunder trick analysis, and carrying out data processing at the place] -- or it can measure by an untrained individual (a patient needs to be included) by transmitting to the health care professionals in whom the middle position became skilled. This example of this invention provides the long-term surveillance of the patient who shows a blunder trick proliferative disease (it is (like leukemia, a lymphoma, myeloma, and ischemia)). Blood gases can be measured using an above-mentioned device combining the disk which has another channel which has the accumulation electrode laid underground in the blunder trick channel, or was applied to the blood-gases measurement on a blunder trick disk. Blood oxygenation (PO2) is measured by the Clerks type electrode which includes a thin layer Cr-Au cathode and an Ag-AgCl wire anode. The quantity of the carbon dioxide in blood is measured by the severe ring type electrode which used ISFET (one type of the magnetic field effect transistor) as a pH monitor. Blood pH is measured using the Si_3N_4 gate ISFET which has a fluid joined part and a contrast electrode which includes an Ag-AgCl wire electrode. Another example of such analytical method about the blood gases performed using a blunder trick disk or these alternative various disks, electrolytic concentration, and other information, It is indicated as a method of changing the method of the microscope scale of Shoji and Esashi (SENSAZU and AKUCHUEITAZU(Sensors and Actuators)B the 8th volume, 205 pages, 1992).

The hemanalysis can also be conducted using the split flow (split-flow) and thin cell (SPLITT) part drawing technique indicated by Bor Fuh and others (biotech Norian . plog . (Biotechnol.Prog.), 11:14 1995 [-20 or]). The example of an outline formed in SPLITT analysis is shown in drawing 19. This process can generate protein and lipid protein, blood platelets, red corpuscles, a lymphocyte, a mononuclear cell, and the wealth fraction of neutrophil leucocyte. At one of the ends, a non-contact annular channel is etched into the disk incorporating a thin wall (drawing 19), and is a splitter of an entrance style. A sample and a carrier style are the confrontation sides of an end, and are introduced, and the chamber is rotated in the direction. Within the chamber to rotate, two clear dividing planes are set up based on a hydrodynamic power and entrance divided flow (ISP) and an exit divided flow (OSP). ISP can be adjusted by adjusting the ratio of a sample to a carrier style. By the method of a sample injection, two clear separation modes are possible, and it is a balance and move mode.
In the balanced mode, division is based on the balance of the ingredient to the used centrifugal field. Separation is optimized by adjusting an outlet flow ratio. Then, wealth fractions are collected from one side of the outlet flow splitters. In move mode, an ingredient is introduced as a thin monolayer on ISP. Based on the difference in a sedimentation coefficient, the

ingredient which shows a high transfer ratio is selectively oriented with the opposite hand of an outlet valve by an orifice. The variable flow valve is indicated by somewhere in this specification. By another example, each SPLITT chamber can be divided to the discrete type needed for it, and ISP or OSP, and the flow is adjusted with the orifice to which the fixed flow was restricted.

In order to fully carry out fractionation of the blood to the fraction identified in the top, five separation which collects two fractions respectively is performed. One example of the microsystem disk of this invention used for this type of fractionation is shown in drawing 19. Five same mind SPLITT cells are identified by C1 (close to the rotational center) to C5 (tending toward the circumference), and are illustrated by this figure. A blood sample is introduced into C1 and applied to move mode separation by rotating a disk at a suitable speed. Fractionation is carried out toward the rotational center and blood platelets and protein (fraction 1) are blood cells (fraction 2).

It moves toward ** and the circumference. By opening and closing the valve in which the disk was positioned appropriately, while the fraction 1 is led to the entrance of C2, the fraction 2 is led to C3. Then, the fraction is applied to a transfer and separation of a balanced mode, respectively. Using such art, the fraction 1 becomes protein toward blood platelets and the circumference toward the rotational center. The fraction 1 becomes protein toward blood platelets and the circumference toward the rotational center. The fraction 2 generates a lymphocyte, a mononuclear cell, and the fractions 3 and 4 that constitute a mononuclear cell toward red corpuscles, neutrophil leucocyte, and the circumference toward the rotational center toward the rotational center. The fraction 4 produces red corpuscles toward neutrophil leucocyte and the circumference toward the rotational center. Therefore, carrying out fractionation of the blood to five separation ingredients is attained.

The activity of the enzyme in a protein fraction can be measured using immobilized enzyme (Heineman, APU by OKEMU biotech (App.Biochem.Biotech.), the 41st volume, 87 - 97 pages, 1993). For example, a blood specific enzyme (it is (like glucose oxidase, alkaline phosphatase, and lactate oxidase)) is fixable with polyvinyl alcohol (PVAL). Lactate oxidase is fixed on a platinum graphite electrode by inserting the film of an enzyme between two-layer PVAL(s). A sensor answers lactate by the electrochemical oxidation of the hydrogen peroxide generated by enzymatic catalyst oxidation of the lactate diffused to a network. The current generated is proportional to the concentration of a peroxide, and proportional to the concentration of lactate one by one. This sensor showed susceptibility to the concentration of lactate of the range of 1.7-26uM.

Each fraction is investigated by separation with the detection system which measures the relative ingredient of a fraction. Instead, each fraction is taken out from a disk through the exit about the further research OFF device. For example, each fraction can be applied to easy

calculation by making the thin steam which passes two electrodes containing a resistance monitor pass a cell. When a cell passes through an electrode, the rise corresponding to resistance is observed and calculated. Then, these data is accumulated based on the particles of the standard set distributed about the size which measures comparatively many of each cellular types in the original sample.

The fraction can be applied to the fluorescent antibody specifically dyed each cellular type. A cell is supported and (U.S. Pat. No. 5,304,487) dyed a suitable place by the minute filter indispensable to a channel, and is washed on a disk. Then, the obtained sign cell is made in fixed quantity as a function of the grade of the fluorescence which it is connected and is dyed the cell.

An example 3DNA size division and mutation detection It is manufactured by Example 1, the double strand melting analysis method using the disk illustrated by drawing 20 is used, and the specific mutation in a DNA size division and DNA in a specific part is detected. A DNA melting meter (by co-owning, on the whole, it is referred to and incorporated here as both indicated by the U.S. patent application consecutive numbers 08/No. 218,030 of the March 24, 1994 presentation under pendency) is beforehand built into the structure of the disk of Example 1. DNA melting meter art uses the fact that the denaturalizing point of a DNA double helix is dependent on the length of the double chain of the double helix, the presentation of a base, and the grade of complementarity. Physical condition of some of the molecule [point / denaturalizing] (in relation to the information acquired from it which can be saved in the microprocessor and/or memory of a device, it can measure to a series of used normal conditions like the concentration of temperature, urea, or a denaturation compound like a formamide.) In order to carry out the size division of all the specific DNA double helixes, one stock is made to fix on a disk by making it adhere to a streptoavidin covering bead. A bead is held with the filter processed by the channel (refer to U.S. Pat. No. 5,304,487). Instead, a bead is a paramagnetism bead held at the channel by constructing a magnetic field using the lodestone incorporated into the disk positioned by approaching a channel. Electromagnetism can be used. Electromagnetism is directly incorporated into a disk and operates by betting 0.8 volt (direct current) at 500 mA. The sign of other stocks is carried out especially using fluorescent dye or a radioactive isotope. Instead, the clear optical characteristic (namely, hyperchromicity) of DNA molecule itself is detected by supervising the absorbance in 260 nm using a non-sign DNA molecule. Although the method of this mode needs the still more elaborate device which generates and detects ultraviolet rays, adjustment of a user's DNA is made into the minimum, and the expense for the DNA manufacture per sample is cut down dramatically. It is fixed, the double helix by which the sign was carried out is placed on a disk, and the buffer solution contained on a disk is covered over operation of the method of this invention for a vapor stream. While developing a vapor stream, DNA controls the inclination of

the denaturation produced in the vapor stream by adding the denaturation thing to the DNA gradually further. A 3.5-inch effective radius is shown and a part for rate-of-flow 10uL/may be produced by the channel of diameter 100um in the revolving speed of 600 rpm.
four buffer solution reservoirs which contain 300uL respectively can be incorporated into each (depth of 800um extended from the 25 to 50-mm position of a diameter) of the quadrant of a disk. By a part for 10uL/, this is applied to the fusion lamp for 30 minutes. It separates into the denaturation thing of the characteristic concentration in inclination, and 2-fold each whorl can be identified as compared with the standard by which the profile information of the denaturation thing is saved in the microprocessor and/or memory of the device. A detection means with appropriate denaturation (detected by the reader of the lower stream of a melting chamber using the radioactive isotope detection machine (Geiger-Mueller calculation total) for the DNA standard by which the sign was carried out with the optical means about ultraviolet absorption, fluorescence detection, or a radioactive isotope.)
The example which uses the disk and device of this mode of this invention, A poly MERASE chain reaction or a magnetic chain reaction (the latter). It is indicated by U.S. patent application consecutive-numbers the 08/375 submitted on January 19, 1995, and No. 226, and it, It is the U.S. patent application consecutive numbers 08th / application record (file wrapper) continuation application of No. 353 or 573 submitted the U.S. patent application consecutive numbers 08th / No. 074 or 345, and December 8, 1994 which were submitted on June 9, 1993. each is incorporated here with reference to the all -- having -- they are detection of the generated DNA fragment, identification, and size measurement.
It amplifies using one primer by which the sign was carried out with the sign in which detection like fluorescent dye or a radioactive isotope is possible, and other primers are adhered to the molecule (for example, biotin) which makes a primer fix in covalent bond.
After amplification (it is either on a ****- disk or a disk as explained to the following Examples 4 still in detail), For example, when a wall surface moves an amplification reaction mixture to the channel or division of a disk covered with the SUTOREPU tor vicine, Or by moving an amplification mixture to the division on a disk including a coupling matrix like the dynal (Dynal) M-280 DINA bead (Dynabeads) (polyethylene sheath paramagnetic particle of diameter 2.8um), The biotinylation double DNA product fragment by which the sign was carried out is made to adhere to the solid base material covered with the SUTOREPU tor vicine. Since the DNA fragment of the contrast set for comparing a standardization size marker with an amplification-products fragment is provided, it is included by the amplification backward division. Many various double helix DNA molecules obtained from two or more amplification reactions by this analysis, or the amplification reaction with separate many, By carrying out a size division one by one simultaneously, and using the sign in which reaction - or fragment-specific detection is possible, each fragment or a series of fragments differ from other things,

or it differs by some of other physical characteristics of the fragment. About the amplification performed by a ****- disk, the bead adhering to a fragment is covered over a channel on a disk with the capability to hold beads (size exclusion by "optical-tweezers"" or magnetic invitation, etc.). In the latter (magnetic invitation) example, the magnetism holding means (lodestone or electromagnet) is indispensable to the disk which was aligned with the first thing and made to rotate the second disk, or it is constructed by the device so that a DNA fragment may be fixed in a suitable division.

DNA size analysis is also fundamentally conducted as above-mentioned, and, as a result, maintenance particles are applied to thermal denaturation inclination. About the heat gradient used for denaturalizing a joint DNA fragment, the Peltier heat pump, direct laser heating, or a resistance configuration element is used, and the temperature of a joint division is increased in the denaturation range by adding thermal energy gradually. The amount of 10micro of rates-of-flow L/may produce in a channel 100 micrometers in diameter, applying to the melting lamp for 30 minutes as above-mentioned. A division applies the sign preparation which denaturalized from combination / melting chamber to the eluted vapor stream as mentioned above. It is a suitable means to detect from combination DNA fragment denaturation [like the laser excitation in the resonance frequency of a color sign and photo diode detection] whose melting chamber is downstream. A raw absorbance or the intensity of other signals, and correspondence temperature, A microprocessor is piled up and the size of each DNA fragment can be determined by comparing with the characteristic saved in the microprocessor and/or memory of internal DNA size marker contrast, a DNA melting profile, and a device.

Melting meter analysis also detects DNA mutation. Manufacture and by BURIDAIZU of the DNA fragment (an amplification derivation fragment and restriction enzyme digestion, or a cloned fragment should be included) which should be examined are carried out using the joint standard (typically wild type) copy of the target gene or gene fragments. A ****- device or the conventional DNA-hybridization method (Hames and Higgins) [Nucleic Acid Hybridization:A Practical Approach and] The volume Rickwood and on Hames, IRL Press: Perform hybridization by using Oxford and 1985. Elution of a hybridization fragment is influenced by the grade of the conformity between the two kinds of DNA stocks (namely, a wild type and a mutant). The one stock uses wild type DNA to which the molecule which allows the immobilization adheres in covalent bond, and hybridization analysis is conducted. Then, the preparation which adhered in noncovalent bond is eluted by washing at a temperature (especially DNA is heated at a temperature lower than it under existence of a denaturing agent like a formamide to a temperature higher than 90 **) quite higher than Tm of the double helix. Elution is supervised and the concentration of the available united single strand product is measured to the further hybridization. Generally, the quantity of DNA eluted is supervised by the extinction of ultraviolet light, for example, and when not eluted any longer in DNA, joint

DNA is thoroughly considered to be a single strand. Wild type DNA is manufactured, and since labeling which can detect only one stock (complementary thing) of mutation DNA which should be examined as a result is needed, a fixed molecule adheres in covalent bond only to one of the stocks which form a double helix. Instead, which stock needs the mutant of both the sign of the detection of is made possible, and can adhere associatively. Even when only one wild type strain has adhered to the fixed molecule in covalent bond, the advantage which carries out the double labelling of the mutation fragment, It is that denaturation and elution of an un-complementary stock can be supervised in hybridization, and that nonspecific combination / hybridization of the mutation to a wild type DNA stock are detectable.

After hybridization is completed, the grade of the complementarity of the stock is measured by change of heat or a chemical denaturation protocol as above-mentioned. By comparing the pattern of unsuitable nature DNA double helix melting produced in either before experimental analysis simultaneous, The pattern produced as a result of double helix melting is analyzed, and it saves in a device microprocessor and/or a memory using a standard, or a single base or two or more non-fitness things are predicted. Such comparison is formed based on making a decision which carries out quick screening of each about the gene polymorphism nature of characterized various illness relation.

DNA mutation is also detectable with a melting meter. By this example, examination DNA is fixed on a disk, and it applies to hybridization / denaturation analysis with the reserve characterization test probe of a lot. One stock is fixed, in order manufacturing using in vitro amplification art is preferred as for a DNA fragment and to make tie molecules adhere to one of the primers in covalent bond using this method as a result. By using this method and denaturing the fully characterized DNA probe of a series the sign of the detection of is made possible, the DNA fragment which should be examined is hybridized substantially and it is eluted. Instead, using the probe the sign of the detection of was made possible with the sign in which various detection is possible, hybridization and denaturation can be multiplexed and, as a result, each probe can be identified (characteristic of the DNA unsuitable nature predicted by each probe). This method is useful to hereditary screening as above-mentioned.

Example 4 DNA amplification and analysis The fragment of DNA is made to amplify in a test tube by polymerase chain reaction (PCR) or a magnetic chain reaction, and capillary electrophoresis analyzes. Reagent mixing in the amplification cycles which amplify a 500bp target fragment, annealing of a primer, extension, denaturation, and analysis of the arrangement are conducted using the device and disk which were indicated in the above-mentioned Example 1. The schematic diagram of the structure of a disk is shown in drawing 21.

A disk includes at least three sample inflow port A, B, and C. The port A makes line bacteriophage lambda DNA of a 30-atto mol (about 100 pg(s)) pour in. The ports B and C are